THE FOUNDRY

Volume 53
Number 12

CLEVELAND, OHIO, JUNE 15, 1925

Published
Semimonthly

Castings Smooth Highways for Auto Travelers

SPENDING millions of dollars for improving approximately 450,000 miles of public highways has made possible the operation of over 17,000,000 passenger cars and trucks in this country. Castings are called upon to assist in building in the neighborhood of 40,000 miles of road

Complicated Machines Mix the Materials When Making Concrete Roads

each year, since much of the machinery used in this industry is made from cast parts, including crushers, mixers, mechanical finishers, graders, rollers, etc., as well as locomotives and cars used to transport the materials from the storage yard to the point of construction. The department of commerce reports that in 1921 the value of road machinery manufactured by 90 companies was $17,858,209, while in 1919, with 58 companies, the value was $15,777,652.

Find Where Castings Can Be Sold

CONTENTS

Scrimping on Sales Expense Is Like Fasting To Grow Fat 467

Selling Cast Aluminum Washing Machines—By Pat Dwyer 469

New System Brings Order from Chaos 473

Managing Steel Foundries—II—By R. A. Bull 476

Secures Uniformity in Ladle Iron—By H. R. Simonds 480

Bill Claims Confusion in Foundry Terms—By Pat Dwyer 484

Recommend Microscope as Control Instrument—By J. Fletcher Harper and H. J. Stein 487

Defends Use of Castings—By E. C. Barringer. 490

Open Western Manganese Plant 491

Marking Patterns Carefully Keeps Records Straight—By Walter C. Ewalt 492

Refining Metals Electrically—By Larry J. Barton 493

How and Why in Brass Founding—By Charles Vickers 483

The Shakeout 498

Trade Outlook in the Foundry Industry 499

Comings and Goings of Foundrymen 500

Equipment Market Report 504

What the Foundries Are Doing 505

New Trade Publications 506

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Selling Cast Aluminum *Washing Machines*

By Pat Dwyer

AMERICAN buying is controlled largely by the housewife, who likes to decide her choice by free trial in her own home.

WITH the possible exception of the brief period Adam and Eve inhabited the Garden of Eden, the human race has been confronted with the periodically recurring problem of washing its clothes. In the beatific and languorous days in the garden, the loose leaf system prevailed, but this perquisite and many others were lost when the original pair were driven forth by the angel with a flaming sword who took his stand in the gateway and forbade them ever to return. Thereafter, the unfortunate pair and their descendants for many generations clothed themselves with the skins of wild beasts. While it is probable they spent no unnecessary time on their ablutions, still it is only fair to assume that occasionally they scraped themselves and their garments and that the more fastidious members tested the efficacy of water as a cleansing medium.

Romance Disappears

By the time the process of weaving cloth had been established, the standards of civilization had been raised many degrees on the scale, and mankind, at least in certain areas, had become quite reconciled to the necessity of keeping their purple and fine linen in presentable condition. For many centuries, and in fact in some isolated communities up to the present, the household linen is purified by trampling it under foot in a convenient stream, or by beating it with a flat stick on a rock in a pool of water.

Then the back breaking washboard was invented over which countless millions of women have toiled and sweated and regretfully have watched their illusions of romance disappear in the drudgery and routine of domestic life. With fingers weary and worn, with eyelids heavy and red, Hood immortalized the *Song of the Shirt*, but to make the story complete he should have added a stanza or two describing its subsequent history. He should have told of the misery it entailed to tired backs and rough, reddened fingers in keeping the shirt in presentable condition.

Considering the vast strides made in the invention and application of labor saving equipment, particularly during the past century, it seems incomprehensible that only during recent years has any attempt been made to wash clothing mechanically and thus relieve the housewife of the most burdensome and dreary detail of household routine. Perhaps partial explanation may be found in the fact that even after some manufacturers entered the field they experienced the greatest difficulty in disposing of their wares.

Wedded to Their Idols

Early machines were far from perfect and aroused no particular enthusiasm among the buying public. The price was comparatively high and only within reach of the well to do. The latter usually hired others to do their washing and, naturally, they were not keenly interested in mechanical aids. The great masses of the people, the potential buyers in large numbers, whose support is required to insure the success of manufacturing enterprises, were blessed or cursed—depending on the point of view—with that prevailing apathy or spirit of conservatism which seems to wed the human race to its idols. The spirit which retards the march of progress.

Bitterly as they regretted the necessity and sincerely as they loathed the idea of bending over a washboard, still they had become accustomed to it over a long period of years and practically had resigned themselves to what they considered their fate. If some person were to present them with food on a silver platter at their door they might accept it with the mental reservation that probably a concealed string later might present itself. If they were told that the same or a similar platter might be secured by making a trip to a neighboring community they would be inclined to wink one eye wisely and dismiss the ambassador with the nonchalant comment that their folks originally came from Missouri. In extreme cases, choleric citizens might be inclined to introduce the visitor—casually or forcibly—to the family dog.

Within recent years washing machines have been manufactured and sold to a considerable extent. They have been of many types designed to be operated by power applied in various ways. Some utilized water power with the supply derived from a pipe connected to the city water main. Others are driven by a small engine using gasoline or kerosene as the motive power.

Still others, and they probably are in the majority, are equipped with a small electric motor. Electric current is available in every city and town at reasonable rates. Many villages have their own generating sets. Farms either are located in the vicinity of power lines or are equipped with privately owned lighting units.

For many years the Maytag Co., Newton, Iowa, conducted a large manufacturing establishment in the production of a patented device for automatically feeding threshing machines. The inception, growth and expansion of this industry presents an interesting chapter in the romance of American business life, but the most interesting feature so far as the present story is concerned, is the manner in which the factory and sales organization have been converted to handle and dispose of a radically different product.

Through various causes, interesting in themselves, but outside the scope of the present discussion, the demand for the automatic attachment and other related devices so far as the Maytag Co. was concerned, dwindled in recent years to a point where their manufacture no longer was profitable. Confronted with the probability of closing the factory, the management conducted a survey of the industrial field in search of some other light project on similar manufacturing line.

Iowa gradually had been developing into the center of the washing machine industry in the United States and for some time the engineering staff of the Maytag Co. had been experimenting along the same line. By the time the company decided a switch was necessary, a model had been made which seemed to present possibilities. A small number were manufactured and sold and the success which followed this initial effort influenced the company to enter the business extensively and to concentrate all its energies in producing the device and pushing its sales.

F. L. Maytag, present chairman of

Wash with it
NEXT WASHDAY or ANY DAY YOU WISH
Wash with it
Wash with it
Wash with it
The MIRACLE of MONDAY
Maytag Multi-Motor Washer
Maytag Sales Co., Inc.
Our machine is just like that one
The Maytag Elec. Washer $155
The Easy Vacuum Washer $125 and up
The HOOVER $52.50 $65.00
Premier Duplex Elec. Cleaner $60
Portable Electric Sewing Machines $28 and $45
Charges Go on Bills of July 1st
Servants to Work for You
Based on Easy Payments

The manufacturer uses magazine and newspaper space as well as attractive circulars and illustrated mailing matter to aid dealers in selling its products. Full use is made of the company trademark which includes the words WITH CAST ALUMINUM TUB. Note the way this is prominently displayed in the advertisements shown. The feature of free trial, in the home and under actual everyday conditions is emphasized in all of the printed matter used and in the sales talks of company and dealer representatives.

the board is neither an inventor nor a mechanical genius. He has a naturally mechanical bent, which has been further developed through many years association with the manufacture, sale and use of mechanical equipment, but he is essentially a salesman and has devoted the greater part of a long life of nearly 70 years to cultivating a natural born gift to a high state of perfection. Having convinced himself that the device had sufficient intrinsic merit to warrant its manufacture, and knowing from experience that the operating force and factory equipment were competent to produce it, he was in a position to view the proposition in a proper perspective. Also, he was free to expand his own specialized ideas in developing a market and to initiate methods of sales and distribution.

How well he has succeeded is apparent from the statement that while there are over 100 manufacturers in this country engaged in the production of nearly 100 different designs and models of washing machines, still in the comparatively short period of two and a half years the Maytag Co., concentrating on one model today is said to sell more than any other three manufacturers of all electric washing machines.

He had none of the average inventor's illusion that given a superior product, a clamorous public would beat a path to his door. On the contrary he went to the trouble and expense of clearing not one nor a hundred, but literally thousands of wide open paths by which he could convey his washing machines to the doors of prospective purchasers. The archaic single path leading to his door might suit the manufacturer of mouse traps 100 years ago, but this is the twentieth century and washing machines are not mouse traps.

The spectacular selling record which has resulted from a well planned sales policy has no precedent in the history of the washing machine industry. The increases in manufacture and sales month by month during a period when business generally has been rated as dead, have been steadily consistent to an almost incredible point. The latest monthly report shows an increase in sales of 103 per cent over a corresponding month a year ago.

Essential Factors

During a recent interview one of the officials of the company outlined the features which he considered principally responsible for present conditions. The first is a product with intrinsic merit and the second is a sales and advertising policy which places the product in the home with the minimum of effort, thought or exertion on the part of the buyer. This is only an example of applied psychology. A device or article which a customer wants is already more than half sold.

In practically every instance a demonstrator takes a machine to a house and begs the privileges of doing the family wash. He is not obliged to beg either hard or long. Irrespective of whether the lady has or has not any existing idea of buying a washing machine, the prospect of having at least one of the everlasting chain of washings done without trouble, effort or expense is a temptation that cannot be resisted. The ease and facility with which the work is accomplished usually is a revelation in more ways than one.

Under a system of training that has prevailed for many years, woman has been relegated to second place and has had to accept whatever man in his role of lord of creation has seen fit to bestow. It is a humiliating position, but it has been sanctified by long training and tradition and usually nothing short of a severe jolt or a national catastrophe will cause her to strike out along new paths. The sight of a machine which does more work and does it better in a few minutes than she has been accustomed to do with infinite labor in half a day serves as a match to the powder keg. Smoldering resentment and bitter repressed antagonism to a fate which has condemned women for generations to the drudgery of the washtub bursts into flame at the prospect of emancipation and the salesman's work usually is done by the time he has completed his demonstration.

National in Scope

Instead of starting on a small scale and building up a local trade to be expanded later as conditions warranted, the company decided to nationalize its product and to that end divided the entire country into five main divisions under the supervision of branch managers. Men were selected for these positions who had implicit faith in the machine and who were endowed with sufficiently broad vision to realize their opportunities.

Branches in turn were divided into districts under the charge of district managers, who sell the dealers in their territories and they in turn usually concentrate on promoting the sales of Maytag machines. The dealers appoint crew managers and demonstrators who form the foundation on which the entire selling plan is based.

The entire advertising appropriation at first was placed with a few magazines national in scope, but later when an analysis seemed to indicate that the returns were not commensurate with the outlay, this policy was changed. For some time past the advertising has been carried in 150 of the leading newspapers of the country, supplemented by space in two magazines with a large home circulation. The text of the advertisements feature strongly the self-sale idea and make a forcible plea for an opportunity to demonstrate the merits of the device in the home. The advertising paves the way and serves to introduce the demonstrator when he calls. He is not handicapped by the passive or active sales resistance which inevitably confronts a stranger with an unknown product. Usually he is acquainted in the neighborhood and the prospective purchasers are familiar to a certain extent through the advertisements with the device he is exploiting.

Local Publicity

As a supplementary measure to the national advertising controlled by the home office, each dealer is obliged to advertise the machine in the local papers in his community. The extent of this supplementary advertising is in direct proportion to the number of machines he distributes.

For the benefit of those living in places where electric current is not available, the company manufactures a machine driven by a small engine operating on oil or gasoline. This machine first was placed on the market in 1914, but the design has been improved and refined since that time. At present with the single exception of the motor it is identical in every respect with the electrically operated device.

The factory and head offices of the company are located in Newton, Iowa, a town of 8500 population on the Rock Island railroad, 140 miles from Davenport, and approximately twice that distance from Chicago. Over 1000 employes, nearly all native Americans work in a large modernly equipped group of buildings. At present the output of washing machines is between 600 and 700 per day. When extensions now under way are completed, the output will reach 1500 per day.

A liberal policy of renumeration toward its employes is one of the cardinal principles of the management and it is claimed that a large measure of its success is due to this policy. For example the molders in the foundry work on a piece rate basis and earn from $8 to $14 a day. These

men are machine operators recruited from the town and surrounding district and many of them have been with the company for many years. It is claimed that the labor turnover is negligible.

Formerly the aluminum tub and other castings for the washing machine were made in one section of the extensive iron foundry also operated on the premises. Recently, to meet the growing production schedule, a new aluminum foundry was erected and equipped in a special manner to handle the various castings that enter into the construction of the machines.

R. H. McIlvaine, Chicago, designed and erected the automatic sand handling and other mechanical equipment in this foundry which is operated on a continuous plan by which the castings are poured immediately after the molds are made. An illustrated detailed description of this new foundry will be published in an early issue of THE FOUNDRY.

Exchange Papers Are Prepared for 1925

J. E. Fletcher, consultant, British Cast Iron Research association, has been delegated by the Institute of British Foundrymen to prepare the annual exchange paper on foundry practice to be presented at the Syracuse convention of the American Foundrymen's association. Mr. Fletcher is one of the foremost foundrymen in England and his reputation and experience assures the highest standard in this exchange paper.

Two French exchange papers will be presented on the behalf of the Association Technigue de Fonderie de France. One will be by Albert Portevin and Pierre Chevenard, two of the foremost French metallurgists, the paper being on the subject, "Dilantometric Study of Graphitization." The second paper will be by R. de Fleury, entitled "Aluminum Alloys and their Casting Peculiarities."

Dr. H. Ries, Cornell university, has prepared the fifth annual American Foundrymen's association exchange paper which will be presented at the June meeting of the Institute of British Foundrymen. G. H. Clamer, past president of the American Foundrymen's association, will present the 1925 annual American Foundrymen's association exchange paper before the fall meeting of the French Foundry association.

This exchange arrangement, inaugurated in 1921, has done much to increase the interest in foundry problems and practices of other countries and has promoted international understanding among foundrymen. Eight papers in all have been contributed by American Foundrymen's association representatives before the meetings of the British and French associations, and ten papers have been contributed by the British, French and Belgian foundry associations to meetings of the American Foundrymen's association.

Detroit Founders Elect New Officers

One hundred and fifty members of the Detroit Foundrymen's association and their friends gathered in the Union League club rooms Thursday evening, May 21 for their annual banquet and election of officers. Circuit Judge Clyde I. Webster, the speaker of the evening, gave an interesting talk on law observance. The officers who were elected for the ensuing year are as follows: President, Robert Crawford, Atlas Foundry Co.; vice president, J. J. Boland, Griffin Car Wheel Co.; secretary, Russell M. Scott, Packard Motor Car Co.; treasurer, Fred Cowan, W. R. Thompson Co. The members of the executive board are K. C. Babo, Dodge Brothers; H. M. Lane, H. M. Lane Co.; Fred Erb, Packard Motor Car Co., and Vaughn Reid, City Pattern Works.

Will Award Scholarship

The school of engineering of Johns Hopkins university will award a graduate assistantship in gas engineering for the academic year 1925-26. This assistantship will pay the holder $500. In return he will be required to spend a number of hours each week assisting in the undergraduate laboratory instruction in gas and fuel technology. Applicants for this assistantship must be candidates for advanced degrees in gas engineering, and the holder will be expected to pursue advanced instruction and research in this field. Persons desiring to submit application or secure further information should address Wilbert J. Huff, professor of gas engineering, Johns Hopkins university, Baltimore, Md.

R. E. Nelles, for three years connected with the tramrail division of the Cleveland Crane & Engineering Co., Cleveland, as New York manager, has resigned to accept a similar position with the Reading Chain & Block Corp., Reading, Pa. He will represent the Reading company in the New York district and the New England states.

Book Review

Scrap Metals, by George H. Manlove and Charles Vickers; 275 pages, cloth 6 x 9 inches, published by the Penton Publishing Co., Cleveland, and furnished by THE FOUNDRY, Cleveland, for $5.00.

This is the second edition of this work, which remains the only treatise dealing with the scrap metal industry. So general was the demand for the first edition that its success necessitated placing the work in a second edition. Being first compiled during the war the early edition discussed practice current at that time. Since then practice has been modified to some extent due to changing economic conditions and therefore in the new edition the authors have revised and rewritten much of the text matter.

The book is divided into two parts, the first dealing with iron and steel scrap and the latter with old metals, or nonferrous scrap. In the first part the authors take up the sources and collections of scrap, its classification, sorting, uses, financing and trading. Following this are four appendices giving the railway storekeepers' classification, miscellaneous mill specifications and government fixed prices. Under old metals the authors discuss the importance of nonferrous scrap and methods of grading. This is followed by chapters on the uses of various metals including copper, brass, aluminum, lead, tin, pewter, zinc, etc. One chapter is devoted to the use of nonferrous scrap metals in alloying.

Forging Cast Steel

A forging test recently was made to demonstrate the quality of the cast steel used by the Industrial Works, Bay City, Mich., in its locomotive cranes and crane equipment. The company operates its own steel foundry for the production of steel castings for its cranes. A slab shaped like a billet 4 x 7 x 30 inches was cast from regular carbon steel.

This slab was forged under the steam hammer into two connecting rods ⅞ x 2½ x 20 inches. This metal forged without any sign of cracking or tearing. A test specimen, 1½ inches square by 20 inches long was forged from the end of the piece and without any heat treatment or annealing a test bar was machined from it which gave the following physical properties: Tensile strength, 76,250 pounds per square inch; yield point, 56,500 pounds per square inch, elongation in 2 inches, 25.5 per cent and reduction of area, 43.4 per cent.

New System Brings Order from Chaos

Patterns Accumulated Through Many Years Classified Under Simple Plan

Fig. 1—Two large books contain a record and description of the patterns grouped under five general and 473 unit headings

IN THE natural order of events changes are bound to occur from time to time in any manufacturing enterprise. Some times they are introduced experimentally for cutting costs or increasing production or both. At other times certain features keep accumulating until they reach a climax that automatically forces the introduction of a change. In many instances changes are introduced as a result of a shuffle in management or a shakeup in the personnel. Usually these changes are made abruptly and while in many instances they result in improved conditions, still instances are not unknown in which the opposite has been the case. Changes and improvements introduced gradually and after due reflection by those who through intimate association are particularly qualified to anticipate their value, invariably are of a more gratifying character. They mesh gradually with old regime and there is no grating or clashing of gears as the industrial machine shifts from low to high speed.

Many changes mark the progress of the Richardson & Boynton Co., Dover, N. J., in the years that have elapsed since the first Henry A. Richardson set up a little stove plant in West Boyleston, Mass., in 1837. Changes have been made in location, in methods and in personnel from time to time as conditions warranted or as they became necessary due to man's limitations in controlling life and death.

This firm is pardonably proud of the fact that it can show a history that is rare in America, a history of an unbroken existence over a period of 90 years. Further, during all that period the fortunes of the enterprise have been guided in unbroken succession by members of the Richardson family. First by the original Henry and later by his direct descendants down to the third generation which now actively is in charge. The founder of the company set a high value on personal and business integrity and laid it down as one of the cardinal principles of success. His successors have subscribed to the same doctrine without reservation and insist upon its observance at all times.

Before taking up a description of a method recently introduced for checking the patterns and castings, it may be of interest briefly to consider the history of the company as the business grew from a little one-man plant to the present great expanse of shops employing 1000 men in Dover, N. J., and with offices and distributing centers inall the principal cities in the East and Middle West.

Expanded Steadily

In 1840 the founder moved his business to Worcester and when Gardner Chilson joined the firm in 1847 they set up a wholesale business in Boston Later the company started a manufacturing plant in Spuyten Duyvil, N. Y., in addition to the one in Boston and also opened an office in New York in 1852. J. B. Cox and N. A. Boynton joined the firm in 1856 and in 1858 the company opened a plant in Norwalk, Conn. In 1865 the firm name was changed to Richardson & Boynton Co. Under this name the firm was incorporated in 1882. Manufacture of steam and hot water boilers was carried on in a plant in Brooklyn, N. Y. until 1898 when the plant in Dover, N. J., was erected and all the manufacturing activities of the company centralized at that point. This plant considered at the time of ample capacity for many years has been expanded several times since its construction and further enlargement is in prospect.

From the foregoing it is apparent that the sizes, types and number of patterns accumulated over such a long period of years must be legion. Keeping step with modern progress, as progress was recognized year by year, the company designed new stoves and new steam and hot water devices, but it also had to maintain a stock of repair parts for the devices already in use. The patterns were numbered or marked in a haphazard manner and once they were placed in production their identity became a mystery except possibly to the foundry superintendent, the molder who happened to work off them and the pattern storage attendant. Fortunately, for many years these men remained constantly on the job and maintained an accurate mental card index of the various patterns. However, eventually the number became so great that any attempt to catalog them mentally became utterly out of the question.

More Difficulty

Lost time and liability of making mistakes on account of faulty identification was not confined to the foundry alone. It began in the office where in many cases elaborate description had to accompany the order and extended to the cleaning and shipping room where the castings were sorted and stored. Many individual pieces resembled each other closely and yet differed sufficiently to condemn them in the final assembly if they inadvertently changed places.

Molders are paid on a piecework basis and accurate checking is required to meet certain rules that insure that the manufacturer will receive all the pieces for which he pays and the molder will be paid for all the good castings he makes or castings that are lost from causes over which he has no control. The molds are counted before they are poured. This preliminary reckoning is known as *taking up the heat* and serves a double purpose. The figures furnish the clerk information on the number of molds actually made by each man and, therefore, a base on which to figure the actual discount. The same figures indicate to the superintendent the amount of iron required to pour off the floor. The second count is made after the castings are shaken out

and is known as the gangway count, where all apparently defective castings, gates and sprues are separated from the castings that are to be taken to the cleaning department. After the castings are cleaned they are subjected to a third count and inspection and those that pass are taken to the storage building where they are placed in bins or on racks.

To maintain an accurate record and to prevent hopeless confusion in the bookkeeping system it is apparent that the count taken at the various points which includes the good castings and those scrapped for various reasons, must correspond. Further, it is evident that a definitely distinctive mark on each casting should prove of real value in the counting process.

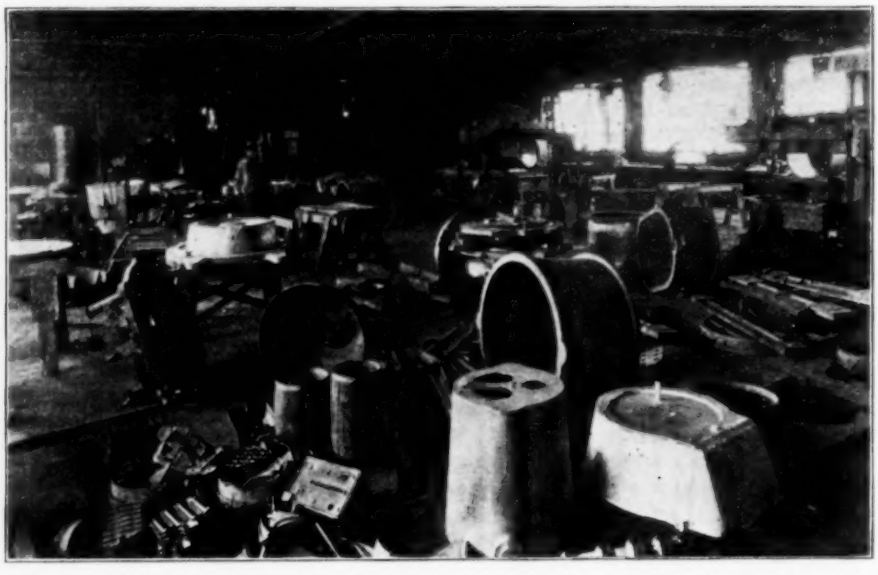


FIG. 2—THE METAL PATTERN SHOP IS FITTED WITH THE NECESSARY TOOLS AND APPLIANCES FOR FINISHING BOTH FLASKS AND PATTERNS

Reduce Number of Units

For some time it was common knowledge that the then existing system was far from perfect but after it was finally decided to take definite action, it was not long before the superintendent realized that many of his problems could be traced to the unsatisfactory method of marking patterns.

In many instances the connection was obvious, while in others the claim that the system was responsible seemed far fetched. Usually a little patient digging proved the accuracy of the diagnosis, just as the same system sometimes traces a remote bodily ailment to its source, a pus formation in the cavity of a decayed tooth. The comparison even holds to the point that the cavity is not always visible.

A preliminary survey designed to bring order out of chaos or even to indicate a point at which a beginning might be made seemed to indicate that conditions had arrived at an almost hopeless point. The fact that the job actually was spread out over the greater part of a year is evidence that it was quite a handful.

If the plant had been shut down, possibly the task of classifying, regrouping and numbering the patterns might have been accomplished in less time, but as it was the work had to be prosecuteed while possibly 1000 patterns were in use in the foundry every day and while a dozen patternmakers constantly were adding to the list either by producing new patterns or by changing various old ones.

Every effort was made to reduce the total number of patterns and to segregate them into groups for purpose of classification. A careful survey of the pattern storage disclosed that many patterns were so similar to one another that in the cause of standardization it would pay to make slight changes or new patterns to make them interchange and thus cut down the number of patterns to be handled for current manufacture. However, although many patterns were in storage, not current but for parts of goods made far in the past, it was necessary to consider the marking and storing of them because the policy of Richardson & Boynton Co. has been to give their customers the best repair service possible throughout the life of the product.

The final result which has been adopted tentatively as standard, but which is open for further revision as occasion may warrant, is represented by a general division of all patterns into five main groups, ranges, furnaces, boilers, laundry heaters and tank heaters. The extent of the detail involved may be gained from the statement that these five groups are made up of 473 units and these units in turn accounted for 4686 patterns at the time the list actually was entered upon the record. By this time the number probably is close to 5000.

Ranges are divided into 37 units with 1627 patterns. Furnaces show 170 units with the largest individual number of patterns 1767. Boilers present the greatest variety in units with 246 made up of 1124 patterns. Laundry heaters are grouped under 13 heads with 96 patterns and tank heaters are lowest in the list with 7 units and 72 patterns.

Two large books 15 x 24 inches illustrated in Fig. 1 contain the record of the patterns. The pages are provided with index tabs corresponding to the various units. The entire set of patterns for each unit is listed together under one heading. Each piece is given a serial number under a key letter and a sufficient margin is left between units to absorb anticipated additions to the list for many years to come. For example, the present range numbers end with 1627, but the furnace numbers begin at 3000 and so on with the other units.

Numbering the Patterns

After the system had been adopted as standard a great deal of actual mechanical detail work remained to place legible numbers on the patterns so that they readily would be discernible to all the workmen through whose hands they passed. In many instances this feature presented no particular difficulty since a wide choice of surfaces was available. In others, considerable ingenuity was required to affix numbers in such a manner and in such a position that they would serve the required purpose without interfering with the appearance of the casting.

With a few exceptions the characters representing the numbers appear on the pattern in relief. Where new patterns are prepared the numbers are cast directly in place and form an integral part of the pattern. Patterns already in existence are converted to the new system by having metal pattern letters brazed on the face. The letters and numbers vary to some extent depending on the size and shape of the pattern, but the paramount idea in all cases is legibility.

The characters employed are of the type known in the patternmaking trade as *Gothic*. They are generously tapered and therefore do not clog eas-

ily with the sand. Further, the sand leaves them readily after the casting is poured and this feature facilitates the identification of the casting at all stages of its progress.

Legibile characters on the castings are a distinct aid in the store room where the parts are taken immediately after they have been cleaned. At one time the services of a man with long experience was required to sort the castings properly and see that they were delivered to the proper bin or shelf. Even then, where some castings resembled others closely, mistakes easily were made. Under the present method practically any ordinary laborer may be trusted to convey the castings from the cleaning room and deposit them in the proper receptacle. An arbitrary number conveys the same impression to a man's mind whether he reads English or any other language.

Perpetual Inventory

Castings stocked in the store room form the basis for a perpetual inventory system. An account is kept daily of the number of individual pieces delivered to each bin and an account also is kept of the number of pieces taken from the bin on order from any of the assembling departments. Duplicates of these orders and records filed in the office serve as a daily check on production and shipment and show the amount of stock on hand at all times. In addition to the total amount of stock the records indicate the amount held in each department at any given time.

With this information available the management is in a position to plan ahead more intelligently, to take advantage of favorable market situations and to follow a production schedule that is stabilized instead of fluctuating with seasonal demand. The latter feature exerts a considerable bearing on the maintenance of a steady community of workmen.

The majority of the workmen, including the highly skilled stove molders, have been with the company for many years. Recently a number of large molding machines have been installed for the production of fire pots and boiler sections and crews of smart young men have been broken in to operate them. This, together with several other interesting features connected with the plant will be described in succeeding articles to be published in early issues of THE FOUNDRY.

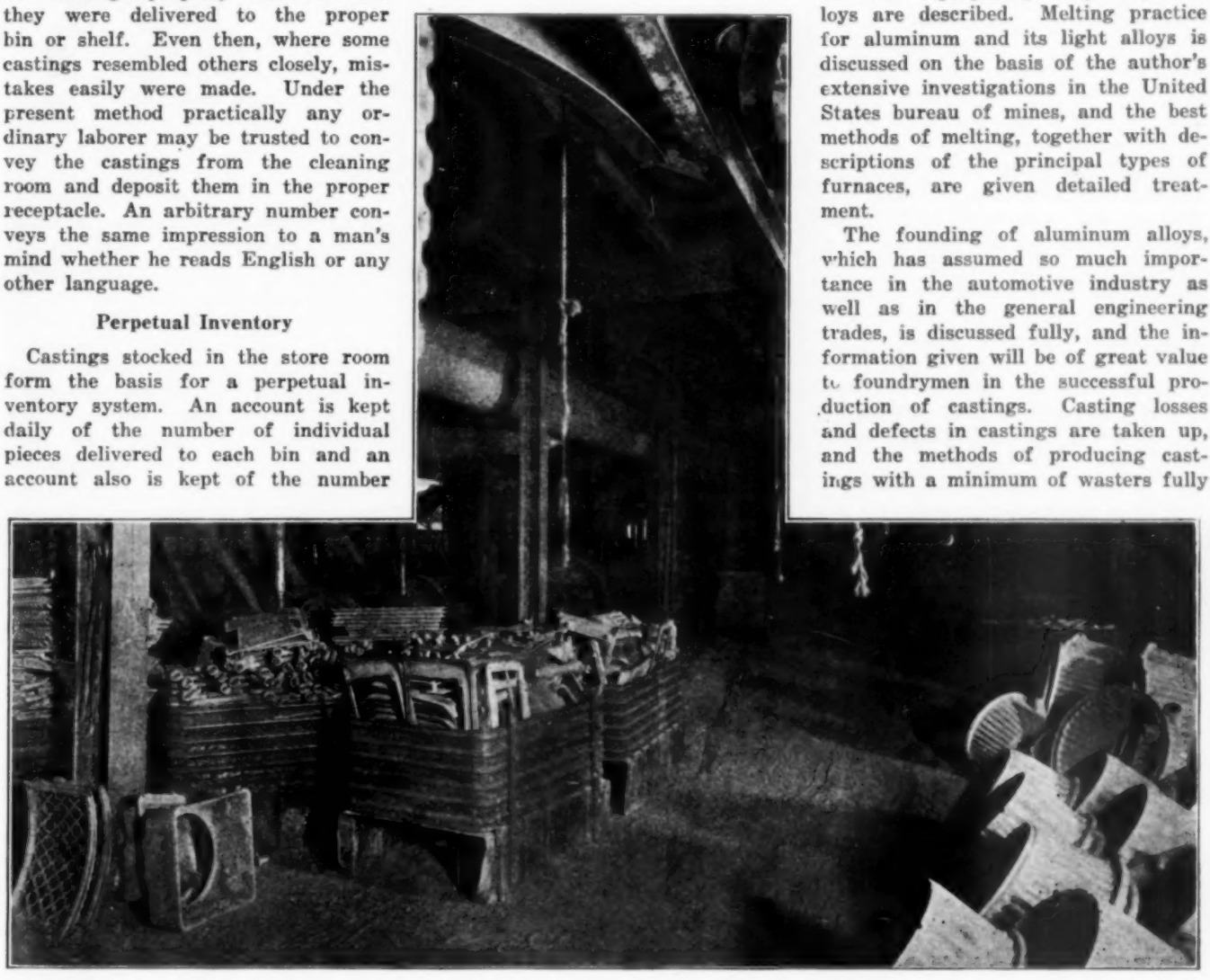


FIG. 3—CASTINGS ARE TRUCKED FROM PLACE TO PLACE IN PRESSED STEEL CONTAINERS MOUNTED ON SKIDS TO ACCOMMODATE AN ELECTRIC LIFT TRUCK

Book Review

The Metallurgy of Aluminum and Aluminum Alloys by Robert J. Anderson, consulting metallurgical engineer, 913 pages, cloth, 6 x 9 inches, published by Henry Carey Baird & Co., Inc., New York, and sold by THE FOUNDRY, Cleveland. Price $10.00 net.

This volume is a thorough and comprehensive presentations of the metallurgy of aluminum and aluminum alloys, covering the subject from the mining of bauxite to the uses and applications of the metal and its alloys.

Considerable attention is given to the preparation of alloys for casting and working, and the most approved methods of preparing the principal alloys are described. Melting practice for aluminum and its light alloys is discussed on the basis of the author's extensive investigations in the United States bureau of mines, and the best methods of melting, together with descriptions of the principal types of furnaces, are given detailed treatment.

The founding of aluminum alloys, which has assumed so much importance in the automotive industry as well as in the general engineering trades, is discussed fully, and the information given will be of great value to foundrymen in the successful production of castings. Casting losses and defects in castings are taken up, and the methods of producing castings with a minimum of wasters fully explained. An increasing number of parts is being made by die casting and permanent-mold casting, and the production of castings by these methods is given consideration.

The chapters on soldering and welding, and on working, spinning and machining will be of great value to the metal worker.

This book will be of great help not only to metallurgical engineers and foundrymen, but also to automotive and mechanical engineers and others interested in specific applications of the metal and its alloys.

Managing Steel Foundries-II

By R. A. Bull

MERCHANDISING, accounting, cost finding, scheduling, research and metallurgical direction all are vitally important in the management of a steel foundry; but the greatest of these is merchandising.

NO ESTABLISHMENT can exist and make money unless it can sell its product at a profit. Therefore, the other questions of accounting, cost finding and the remainder all tend to one end.

MAJOR BULL, in this concluding section of his able paper on management deprecates the effort to sell castings for uses beyond their field or for which they are unsuited. He urges the establishing of a service department which will represent the buyer as well as the foundry.

SOME details appropriately may be mentioned regarding the manner in which the staff departments should function, although the nature of the particular foundry's business has much to do with such matters. It is possible to outline some of the major considerations, from a general standpoint. A farsighted merchandising division in any branch of industry should not generally expend useful effort in attempting to develop business that from an economic standpoint belongs elsewhere, either because of other material better suited for the job, or because of the location of producer with respect to consumer. It may be wise to make a temporary exception in an emergency, such as a low volume of suitable business available. No sales department regularly should try to secure orders for parts that will be entirely satisfactory when produced from weaker and less expensive metals. A well-managed steel foundry ought first to understand its proper function in industry. The fitness of the part for the use intended always should be considered carefully. Any other policy, if carried sufficiently far, will react unfavorably on the management responsible, and in the end will benefit nobody.

It is necessary, in a farsighted merchandising policy, to have the closest co-operation between sales and operating officials. The latter, because of early training and present responsibilities, have their practical sense well developed. They often have sound ideas as to the ultimate result to the consumer and to the steel foundry of efforts to secure business in certain fields. Sometimes the attitude of the operating head is that of a disgruntled man who feels under the handicap of making, against his protest, work that is entirely unsuited to his equipment or that belongs by every economical consideration in some other branch of the metal industry than the steel foundry.

The sales department can employ a man usefully, and sometimes several, much of whose time can be devoted to *service*. To be effective, this subdepartment must have the combined viewpoint of the operating and selling organizations. It should be under the direction of the merchandising department. Everyone in this subdivision should be thoroughly familiar with the way castings are made, and therefore be able to explain to a consumer, the reason for any defects regarding which he may complain. Sometimes a consumer's attitude toward an imperfect product is completely changed after learning of the numerous factors involved and the vast amount of effort expended in doing a perfect job. It never pays to practice the slightest deception in such a matter. The customer has a right to know the facts.

The accounting department of any relatively large plant sometimes acquires systems involving costly records that may continue to cause expense long after they serve useful purposes. This is liable occasionally to occur without the realization of the management or the men supposed to be aided by examination of the data.

It seems advisable for an executive periodically to make a comprehensive analysis of all clerical records, and regulate their continuance by their future utility. In some cases there will thus be disclosed a good use, now discontinued, that was once made of a record, that could serve a useful purpose. In other cases clerical work is performed at considerable cost daily to prepare records that are mechanically distributed and filed by the man supposed to be helped by the records, but who, through the development of the business or department, no longer has need for them. It may be unfair to blame a department head for failing immediately to call attention to the fact that he no longer requires forms that previously were useful. A man in charge of many shop details generally has his mind on more important matters than that of the real utility of all report forms. Campaigns to eliminate superfluous records and to dispense with unnecessary clerical help in certain foundries materially have reduced overhead expense without imposing a handicap of any kind. It is unnecessary to make extended reference regarding the purchasing department. However, it may be pointed out that there are some buyers to whom the management gives more latitude in the selection of materials on a price basis than is economical. This evil has prevailed in the steel foundry industry as in others. Men responsible for mechanical operations are entitled to the full consideration of their views on commodities and equipment.

One large steel casting plant whose purchasing department was conducted efficiently, apparently permitted all selections to be made by the purchasing agent, while in reality the procedure was far different. The buyer was guided strictly by the preferences of the operating department as given to him after a study of all proposals, gaged in degree of desirability expressed whenever possible, in definite terms. For example, if the foundry needed a lathe for its maintenance department, the operating head requested the purchasing agent to secure proposals from sources indicated by the plant. A careful examination of the good points of each tool offered was made, followed by a report to the purchasing department indicating, first, second, and third choices, and the extent to which each choice was justified in first cost according to the judgment of the plant. This scheme was followed with perfect satisfac-

LUBRICATION OF AIR COMPRESSORS*

In the operation of air compressors, most of the troubles experienced may be traced to the use of a poor grade of oil in the air cylinders. The importance of good cylinder oil is now recognized by all the leading manufacturers of lubricants, and all of the reputable oil companies today produce an oil which they recommend for air cylinder service. Use only the best grade of air cylinder oil as sold by any of the reputable oil companies.

Use only enough oil to furnish lubrication, that is, only enough to keep the cylinder walls and valves just greasy, neither dry nor wet. It is neither burned, vaporized or washed away. Therefore, a small quantity of the correct oil will maintain the necessary oil film, the prime function of which is to assure a piston seal. With the correct high grade oil in use the presence of any deposits on the valves means, either too much oil or that the intake air is dirty.

As a guide to show approximately the amount of air cylinder oil required for good lubrication, the following table shows the drops per minute for different size air cylinders and also the maximum quantity in pints per 10 hours that should be used. Cylinders having corliss valves should use 50 per cent more oil. The figures given are for one cylinder only.

For duplex or compound machines both cylinders must be considered.

QUANTITY OF OIL REQUIRED FOR ONE CYLINDER

Cylinder Diameter Inches	Piston Displacement	Rubbing Surface Sq. Ft.	Oil Feed Drops per Minute	Oil Feed Pints per 10 Hours
Up to 6	Up to 65	Up to 500	1	.05
6 to 8	65 - 125	500 - 750	1	.08
8 to 10	125 - 225	750 - 1100	1	.11
10 to 12	225 - 350	1100 - 1500	1 - 2	.14
12 to 15	350 - 600	1500 - 2000	2 - 3	20
15 to 18	600 - 1000	2000 - 2600	3 - 4	.27
18 to 24	1000 - 1800	2600 - 3600	4 - 5	.36
24 to 30	1800 - 3000	3600 - 4800	5 - 6	.48
30 to 36	3000 - 4500	4800 - 6000	6 - 8	.60
36 to 42	4500 - 6500	6000 - 7500	8 - 10	.74
42 to 48	6500 - 9000	7500 - 9000	10 - 12	.90

*From Trade Standards adopted by the Compressed Air Society, 50 Church St., New York.

(*Continued on Data Sheet No. 578*)

LUBRICATION OF AIR COMPRESSORS

(*Continued from Data Sheet No. 577*)

LUBRICATION TROUBLES

If the oil used in the air cylinder does not give proper lubrication when used in the amounts recommended, consult the oil company from which the oil is purchased. They have experts who follow up lubrication troubles and will see that the proper oil is supplied. If lubrication troubles exist, examine the air intake to the compressor. This may be done by getting into the air intake and seeing if dirt adheres to the sides and pockets, for if the intake air is dirty this will account for apparent lubrication trouble and a proper air cleaner should be installed at once.

CLEANING CYLINDERS

Never clean cylinders with kerosene, benzine or gasoline. This is dangerous and should be prohibited. If there is any tendency for carbon to form in a machine, the use of soap suds is recommended. A good cleaning solution is made of 1 part of soft soap to 15 parts water. The suds should take the place of oil for a few hours and be fed into the air cylinders about once a week either by a hand pump or through the regular lubricator at a rate about ten times as rapid as that of the oil. The cleanliness of the air valves when inspected, as they should be periodically, will indicate whether greater or lesser application of the soap suds should be made. After using soap suds, open the drain cock of the air receiver and of the intercooler in the case of compound machines, to draw off any accumulated liquid. Oil should be used again for a half hour before shutting down the machine, to prevent rusting the cylinder and valves.

(*Concluded on Data Sheet No. 579*)

THE FOUNDRY DATA SHEET, JUNE 15, 1925
Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

Around the World with The Foundry

Little Journeys to the homes of our readers

·Chile

ACTUATED by entirely different motives two famous white men entered in the early days of the 16th century what is now known as the shoe string republic of South America. Magellan the Portugese landed on the southern tip on his voyage around the world in 1520. Pizarro's lieutenant Almagro headed an expedition southward from Peru in 1535 in a quest for the gold and silver mines of the Incas. A second expedition under Valdivia seems to be the only one worth recording, for it founded the city of Santiago in 1542.

Lying on the western side of the mighty Andean mountain range, the great bulk of Chile's commerce with the outside world is carried on through her Pacific ports Santiago, Valparaiso and Iquique. Nitrate found in the barren, rainless northern section of the country forms the great source of the nation's wealth and is shipped through the port of Iquique to the value of $50,000,000 a year.

Foundries are located in all the mining and transportation centers and in four of the principal plants in the country. The Foundry is delivered twice a month and keeps the executives in touch with the world wide progress and development of the casting industry.

"Wherever metals are cast you'll find THE FOUNDRY"

tion to the two departments concerned.

The steel foundry industry probably has suffered as much from lack of attention to cost finding as has any other manufacturing business. Undoubtedly it has needed improved methods of cost accounting more than have numerous other industries which, because of their product, more easily permit the installation of a good cost system. The jobbing foundry presents a difficult problem in the adoption of many cost finding schemes that can be applied satisfactorily elsewhere. The principal element that must be kept in mind in applying any system to a steel foundry is related to the sense of proportion. Some schemes are too elaborate to justify the expense of determining actual costs in view of the returns on a small order for castings.

In the foundry making a wide variety of castings on orders, each of which frequently calls for few pieces, the general procedure in attempting to solve the cost problem is to classify by weight. In the earlier days of the industry weight classification was of undoubted benefit. It was the first effective step that could have been taken.

The weight of a casting generally has a great influence on its cost of production, and consequently on its proper selling price. However, other factors make weight classification alone rather deceptive. It is unfortunate that up to the present time, many steel founders have adhered to the practice of classifying foundry costs by weight divisions. This has handicapped the industry and all served by it.

The amount of drafting work necessary in a steel foundry may be so small as not to require the entire time of one person.

Calculates Weights From Drawings

Every steel foundry doing jobbing work frequently must calculate estimated weights from customers' drawings. This is properly the draftman's job, and sometimes requires much time. Many inquiries are received for prices on castings, the weights of which are not indicated on the customer's drawings or requests for quotations. Engineers associated with companies consuming steel castings can do much to help themselves and assist the foundry by showing the estimated or actual weights of castings on all drawings. The mecrhandising department is unable intelligently to establish all important factors relating to the appropriate selling price until the weights of the castings are known or estimated.

Failure of the customer to furnish weights of castings previously made at another foundry generally is due to oversight by the purchasing agent. The omission of estimated weights on a drawing for a new casting frequently is an unjustified error, due to lack of understanding of weight significance to the foundryman. In most cases the engineer is required to estimate the weights of new castings to ascertain the probable cost of the equipment of which the castings are to be parts. The prospective purchaser usually has the information, to give to those requested to bid.

All foundrymen would appreciate a more pronounced disposition by engineers to keep this detail in mind. Better co-operation between purchaser and consumer along this line will assist the prompt receipt of quotations in closer conformity with production costs.

Specific reference should be made to a few details in the order or schedule department. Some shops have more or less novel and effective adaptations of the general plan for conducting this small but important division. One consists in a record of the number of delivery promises kept during each month. The final percentages are scrutinized with care by the management. Such a plan probably brings the best judgment to bear on the customer's request for information as to shipment.

In some foundries daily meetings are held, presided over by the head of the order department, and attended by every shop foreman concerned in the execution of orders for castings. All requests for delivery promises are there considered, and information is exchanged regarding the elements involved in delivery. The plan undoubtedly has some advantages. Its application in any foundry should be considered with reference to the practicability of assembling all interested persons at one time, thus simultaneously removing from their departments the men concerned.

The research, or experimental, department should be active although its personnel may sometimes be a single individual. When one man is selected to direct all of the investigations, provision must be made for periodically giving him assistance. This generally causes no complications to routine operations. The extent of the plant's activities easily may be such as to justify regularly the time of several persons for experimental work. The man actively in charge of research should report to the plant manager and be in close contact with him. A manager generally has a much more practical idea of results that may come from investigations than has an investigator, who because of his regular occupation may be absorbed in a problem that appeals more to the imagination than is justified by its probable useful application.

The research engineer, except in rare cases taking little of his time, should not have responsibilities relating to production routine. The smallest steel foundry gives ample opportunity for one good man to spend all his efforts on technical investigations that will improve quality or reduce costs.

The metallurgical department of a well-organized steel foundry should be the source of general instructions to those in charge of melting and heat-treatment. It should scrutinize current literature relating to these operations, and to all matters connected with tests of significance to the industry. The company should keep informed of actual or needed developments in formulating and revising specifications for its product.

A well-equalified metallurgist is a highly valuable member of the organization. His duties should include much more than the general supervision of routine furnace operations, physical tests, and chemical analyses. He should collaborate with the research engineer, and like him, should have a practical point of view to balance his scientific training.

Systematize Inspection

In the regulation of a systematized inspection department, much depends on the man in charge. His task is associated daily with as many complexities and demands for the exercise of good judgment as is that of the man in charge of the order department. This individual probably should have more disposition to act on his own judgment alone than is advisable in the case of many other subordinates in the steel foundry, to discharge the duties outlined successfully and conscientiously with regard for the customer's interests. Definiteness of conviction should be preceded by much practical knowledge of foundry conditions and by considerable information regarding general industrial application.

A casting may be suitable from the standpoint of surface appearance, but contain vital defects in the interior. The chief inspector should have facilities for ascertaining the soundness of sections, to remove all doubt before the product is delivered. This may be accomplished satisfactorily and systematically by destroying representative castings by machining operations that disclose the interior. The

most skillful foundrymen cannot be trusted always to produce castings free from shrinkage cavities and other serious defects, unless aided by observing samples cut into pieces. When this discloses an undesirable condition, the experienced foundryman can modify his practice to overcome the defect.

The use of templets and gages by the chief inspector's subordinates is made satisfactory by checking these with master-gages in the execution of production jobs. The importance of this is not always realized. Gages are sometimes zealously used, but are ineffective because of wear. If the nature of the order for castings makes master-gages impracticable, there should be periodic checking of regular gages from drawings.

Compensating Workmen

In large foundries it is advisable. in the author's opinion, for the plant manager to have a man who has had considerable experience in the operating departments, who has tact and cleverness, and who combines carefulness with proper consideration for the mutual interests of the men and the management, to be engaged continuously in the study of compensation to workmen doing piecework, taskwork, and daywork.

Too many employers have in the past pinned their faith to the installation of a piecework plan as the cure for their troubles with workers. Much thought should be given to the operation of a piecework scheme. Probably in no other industrial enterprise is this more true than in the case of the jobbing foundry, because of the great variety and short duration of the tasks, some of which are of such nature as to preclude satisfactory piecework rates.

There are many more or less ingenious plans for applying piecework principles to steel foundry operations. Some guarantee a minimum daily wage to the man, and give him in addition, a reasonable sum for a stated amount over the established number of tasks. Certain compensation plans go further, and provide for increasingly greater piecework rates as the speed of the man advances beyond the average rapidity of execution. Some plants pay bonuses semimonthly or monthly for constant attendance during designated working hours. Bonus schemes may be applied profitably to some production jobs that have been running in foundries for long periods. These may be based on a minimum percentage of defectives.

Piecework compensation of molders in some foundries has been advantageously developed by time studies to show the proper relative significance of every detail of a molder's task. Such a scheme employs a unit system for calculating equitable rates, by indicating the time required for each step in making a complete mold. Such a system, carefully planned in a spirit of fairness, possesses important advantages, particularly in establishing without delay, suitable rates for new jobs, and in convincing molders, as the result of experience, that they are getting a square deal.

There are certain well intended compensation schemes for workmen which are equitable in principle and which sometimes appeal to inexperienced executives, but which result in relative inefficiency because of their complicated nature. The average workman in a shop where operations either are repetitive or of a character producing more or less of what the inexperienced would call confusion, is generally of a type unable to grasp all the details of an elaborate wage scheme involving numerous factors. A plan that is perfectly clear to educated men often will fail to be understood by those who have not had the advantage of much mental training. This is true of workmen of any nationality or color.

It is well to advise men who do piecework and who are paid bonuses for low percentages of defectives, regarding the results of their work each day. Such advice sometimes is given in the form of posted figures on the man's floor or bench where he and his associates can examine them. Occasionally this produces a wholesome rivalry that is more stimulating than the increased wages.

It is appropriate to say in passing that on certain operations in the steel foundry piecework on a tonnage or other basis should not prevail, for reasons that relate to quality.

Given suitable equipment and the proper amount of direction, experienced molders will do satisfactory work at a stated price per mold. In this and similar foundry operations there is not the danger of sacrificing quality for quantity that exists, for example, in melting steel, in heat-treatment, or in welding castings. Men who are paid for quantity production in the operations mentioned and in similar ones are likely to be influenced in their work in a way to detract from the quality desired by the management.

Where piecework cannot be effectively employed, a taskwork plan is sometimes advisable. Much thought should be given this arrangement as applied to a crew of men, to prevent abuse. The inherent weakness of the scheme, as ordinarily employed, lies in compensating each man in the gang on the same basis, despite the fact that some individuals may be much faster workmen than others. The larger the crew, the greater will be the difference in the work done by each person, with resulting justified dissatisfaction.

Paying The Foremen

The compensation of those actually responsible for directing shop operation, beginning with the superintendent and including such men as core foremen and cleaning-room foremen, requires as careful consideration as does the compensation of the workmen. Many steel foundries supplement the monthly salaries given these men by bonuses for individual meritorious achievement. Certain of these bonus arrangements are extremely interesting both as to plan and apparent results. Without doubt some sort of bonus plan is desirable for the payment of foremen, provided fundamental considerations are satisfied. These include first, the payment of a salary fully in keeping with the routine responsibilities carried, and with local conditions, if they in any degree establish a rate for a similar occupation; second, a bonus that will reward the faithful and effective individual liberally for signal service performed; third, a bonus scheme, all details of which can be fully explained and completely understood by the men to whom it is applied; fourth, a plan which, in justice to the management, is based partly on the general financial showing of the plant or on factors that cannot be dissociated from it, to prevent in hard times the payment of compensations on a scale out of proportion to prevailing circumstances. It is extremely undesirable to reduce salaries except under the most exasperating or critical conditions. It is also inadvisable temporarily to abolish a foremen's bonus plan, or modify it so that it will carry smaller perquisites than were originally prescribed.

Therefore, a bonus plan for foremen should be rather comprehensive and be developed with ample consideration to operating profits and the man's part in creating them. When substantial bonuses are earned by a few principal subordinates at times when the company's operations as a whole are not profitable, payment should be made gracefully as long as it is made at all, so that the good effect of the reward on the recipient will not be nullified.

Any plan for paying bonuses to principal shop subordinates should

provide in an auxiliary way for each of a number of valuable men performing duties not directly related to production routine. If such men are not included in the bonus plan, they invariably feel that circumstances have operated unfairly to prevent their earning appropriate compensations for the fidelity and skill with which they may perform allotted tasks. It often is difficult to establish a special compensation plan for each of the men in this general class. The management should so solve the problem as to convince employes that they will be specially rewarded for particularly meritorious execution of duties.

Adopt Plans to Expedite Standardization

A plan to intensify the national standardization movement by lending the American Engineering Standards committee the support of the advisory committee consisting of five executives representing many of the largest industrial interests of the country had its inception recently at a dinner given by James A. Farrel, president, the United States Steel Corp., to 30 industrial leaders. The five men chosen to act on the committee are: James A. Farrel, president United States Steel Corp.; G. B. Cortelyou, president Consolidated Gas Co., New York; J. W. Lieb, vice president New York Edison Co.; L. F. Loree, president the Delaware & Hudson railroad Co.; Gerald Swope, president the General Electric So.

The American Engineering Standards committee, organized in 1918, has been engaged in standardization work on a national basis since that time. Its membership includes 34 national organizations made up of nine engineering societies, 18 industrial associations and seven departments of the federal government. It serves primarily as a clearing house for national engineering and industrial standardization. Its purpose is to co-ordinate standardization work in the individual industries effected by associations, societies and governmental agencies, into a workable and unified system.

Attention is directed to the significant fact that about 250 organized trade, technical, industrial and governmental bodies are represented or are actively co-operating with the American Engineering Standards committee, with 1200 accredited representatives on its various working subcommittees. This extensive participation is the work of the committee assures the acceptance and actual adoption of the national standards worked out and approved. At present some 170 standardization projects are actively under development or have reached the stage of approved standards.

Gray Iron Stressed in Syracuse Program

Three sessions, devoted strictly to gray iron foundry topics, have been planned for the American Foundrymen's association convention to be held the week of October 5 to 9, at Syracuse, N. Y. One session will be held Monday afternoon, Oct. 5, another Thursday afternoon, Oct. 8, and the third Friday morning, Oct. 9.

An especially good list of authors has been secured to present papers for discussion at these sessions. Some of the authors, together with the subject of their papers, are as follows:

Melting Cast Iron in the Electric Furnace, by GEORGE E. LAMB, Lamb Machinery Co., Hoquiam, Wash.

Gray Iron Foundry Problems, by J. H. HOPP, Hopp-Patterson Co., Chicago.

Mechanical and Physical Properties of Gray Cast Iron and Semisteel, by O. W. POTTER, University of Minnesota, Minneapolis, Minn.

Nickel in Cast Iron, by DR. PAUL D. MERICA, International Nickel Co., Bayonne, N. J.

Oxygen in Cast Iron, by representative of the U. S. Bureau of Standards, Metallurgical Division, Washington, D. C.

Relations between Engineering Properties and the Constitution of Cast Iron, by J. W. BOLTON, Niles Tool Works, Hamilton, Ohio.

Influence of Phosphorus on the Total Carbon Contents of Gray Iron, by JAMES T. MACKENZIE, American Cast Iron Pipe Co., Birmingham, Ala.

Superheating Iron in the Cupola, by S. J. FELTON, Ohio Mechanics Institute, Cincinnati, Ohio.

Dilatometric Study of Graphitization by ALBERT PORTEVIN and PIERRE CHEVENARD, Annual exchange paper of the Association Technique de Fonderie de France.

Cupola Investigations, by JOHN GRENNAN, University of Michigan, Ann Arbor, Mich.

Core Binders, by H. L. CAMPBELL, University of Michigan, Ann Arbor, Mich.

In addition to sessions at which these gray iron papers are scheduled, others of the general meetings will prove of great interest to the gray iron foundrymen. Some of these other sessions will be devoted to sand control, apprentice training and foundry refractories.

Book Review

A B C of Iron and Steel, edited by A. O. Backert, fifth edition; cloth, 413 pages 7½ x 10½ inches; published by Penton Publishing Co., Cleveland, and supplied by THE FOUNDRY, for $6 postpaid, and in Europe by Penton Publishing Co. Ltd., Caxton House, London, for 30 shillings, net.

Simplicity, conciseness and comprehensiveness continue to mark this work, now appearing in its fifth edition, and the need for such a text among the more technical treatises is proved by the continued demand. While the A B C makes no pretension to being exhaustive, and its language is devoid of highly technical terms, designed for the eye of readers possessing little general information of the industry, it is valuable to those highly skilled in one department in gaining a broader view of the industry as a whole.

The volume is uniform with preceding editions in type, illustrations and binding. A chapter on alloy steels by Marcus A. Grossmann, in charge of the research division of the metal department of the United Alloy Steel Corp., has been added to cover this rapidly developing department.

All statistical matter has been brought up to date and additions have been made. In the directory section thorough revision has brought the material up to date and this is the latest presentation of the names of companies, products and officers now available. Classification by name of company and also by products makes this reference especially valuable.

Demand for preceding editions has testified to its value to the reader and the present edition well sustains the high mark set in earlier issues. It is the only popular treatise on the industry, with its several chapters written by men especially fitted for the task, giving a composite representing the best thought of the entire industry.

Remove Red Stains from Brass Castings

At the annual general meeting of the Institute of Metals held in London, England, recently, E. A. Bolton presented a paper on the removal of red stains from brass.

Various considerations affecting the oxidation and staining of brass are reviewed in this paper and the difficulty of avoiding staining with brass of high copper content is described. The theory of staining occurring by reaction between cupric oxide and the pickling acid is described and attributed to concentration cell action. Electrochemical difficulties in stain removal are shown.

Attention is turned to the use of solutions containing sulphuric and nitric acids for stain removal. While such solutions show some possibility of success, results are not so favorable as those obtained with solutions of dichromate and sulphuric acid. The action of these solutions is explained and described in detail and details are given suitable for the development of the process upon a commercial scale.

Fig. 1—Pulverized Coal Preparation Plant of the Hunt-Spiller Mfg. Co., South Boston, Mass.

Secures Uniformity in Ladle Iron

New England Producer of Old-Fashoned Gun Iron Equips Waste Heat Boiler and Reverberatory-Type Melting Furnaces with Pulverized Coal System—Operating Advantages Are Gained

By H. R. Simonds

WHEN Cyrus Alger, working in his metallurgical laboratory in Boston in 1812, discovered a process for increasing the strength of gray iron castings, he undoubtedly did not dream that more than 100 years later the result of his work would play an important part in this country's transportation system, and, of course, he could not have foreseen the extensive plant of the Hunt-Spiller Mfg. Co. in South Boston which, gradually has been built around his original metallurgical processes.

The Cyrus Alger process of increasing the strength of castings was used for 75 years in the fabrication of ordnance, and from this application the product acquired the name of gun iron. This cognomen still is retained, although many alterations and refinements have been made in the product during recent years.

When steel supplanted iron in the ordnance field, new uses for this type of gun iron were sought. Success gradually was acquired in producing

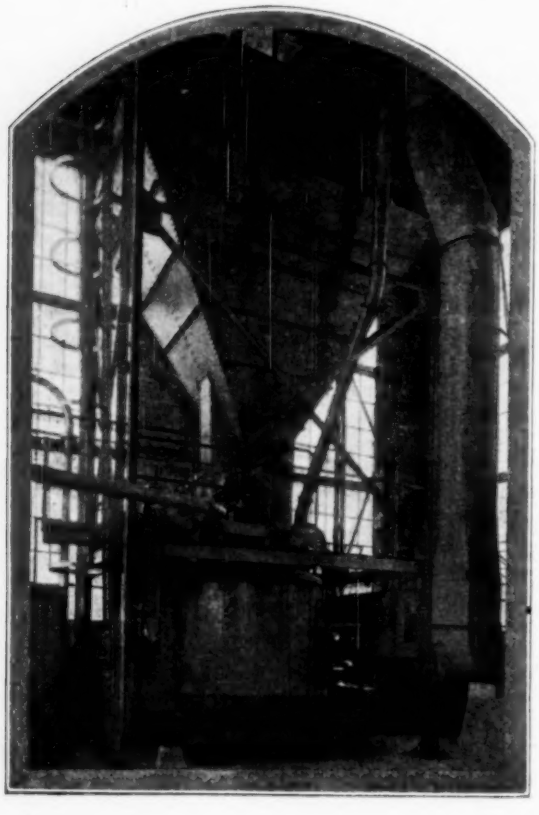


FIG. 2—(LEFT)—A 20-TON STORAGE HOPPER FOR PULVERIZED COAL IS MOUNTED ABOVE A WEIGHING TANK. COAL IS CONVEYED THROUGH A STEEL PIPE AT THE RATE OF ½-TON A MINUTE

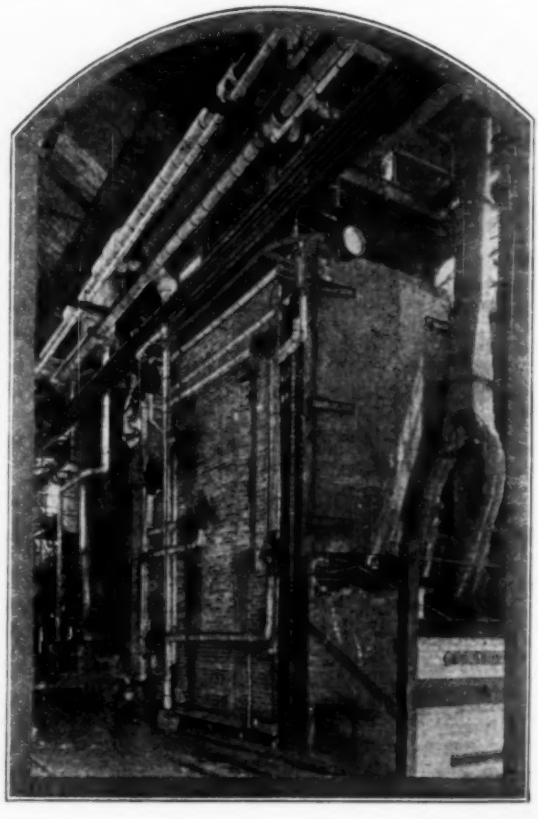


FIG. 3—(RIGHT)—FRONT VIEW OF THE BOILER FIRED WITH WASTE HEAT FROM TWO MELTING FURNACES. WHEN BOTH UNITS ARE ACTIVE THE BOILER DEVELOPS 200 PER CENT OF ITS RATED CAPACITY

certain castings for locomotive construction.

Because of the attention paid to the metallurgical end of the business, improvements in the manufacturing process, which tend toward greater uniformity of ladle iron, constantly have been sought. In this connection an extensive pulverized coal system recently was installed, which has many features of particular interest.

While uniformity of furnace production was the chief consideration in making the change to powdered fuel, increased capacity due to elimination of grates, a saving in coal consumption, and many other advantages have resulted. Previous to the installation the company operated six hand-fired air furnaces each about 28 feet long, 7 feet wide, and 4½ feet high of the reverberatory type, charged through the top by removing the bungs. These furnaces have a maximum capacity of 30 tons to a heat. The general pouring practice is to tap the furnaces one at a time in sequence. Two and 3-ton ladles are used and under normal conditions an hour and a half is required to distribute the metal from one furnace. Pouring practice calls for a temperature at the pouring floor ranging from 2500 degrees to 2650 degrees Fahr. depending on the class of castings produced. Because of a fairly long distance from furnaces to pouring floors, this means that the tap spout temperature must range from 2700 to 2750 degrees Fahr. or more.

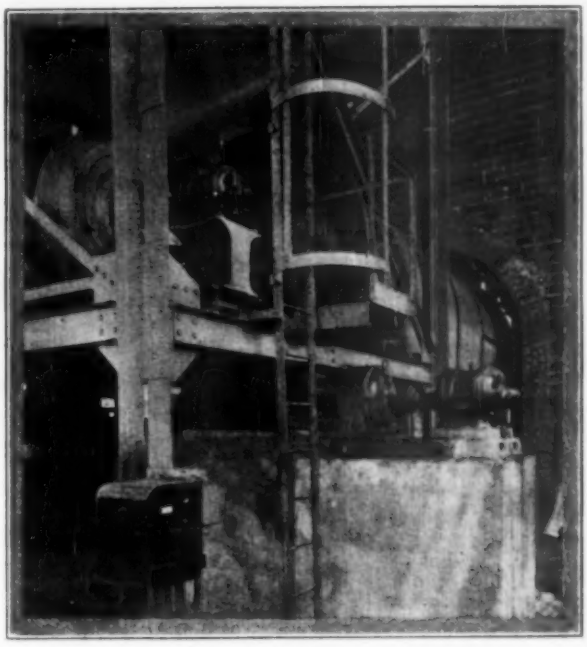
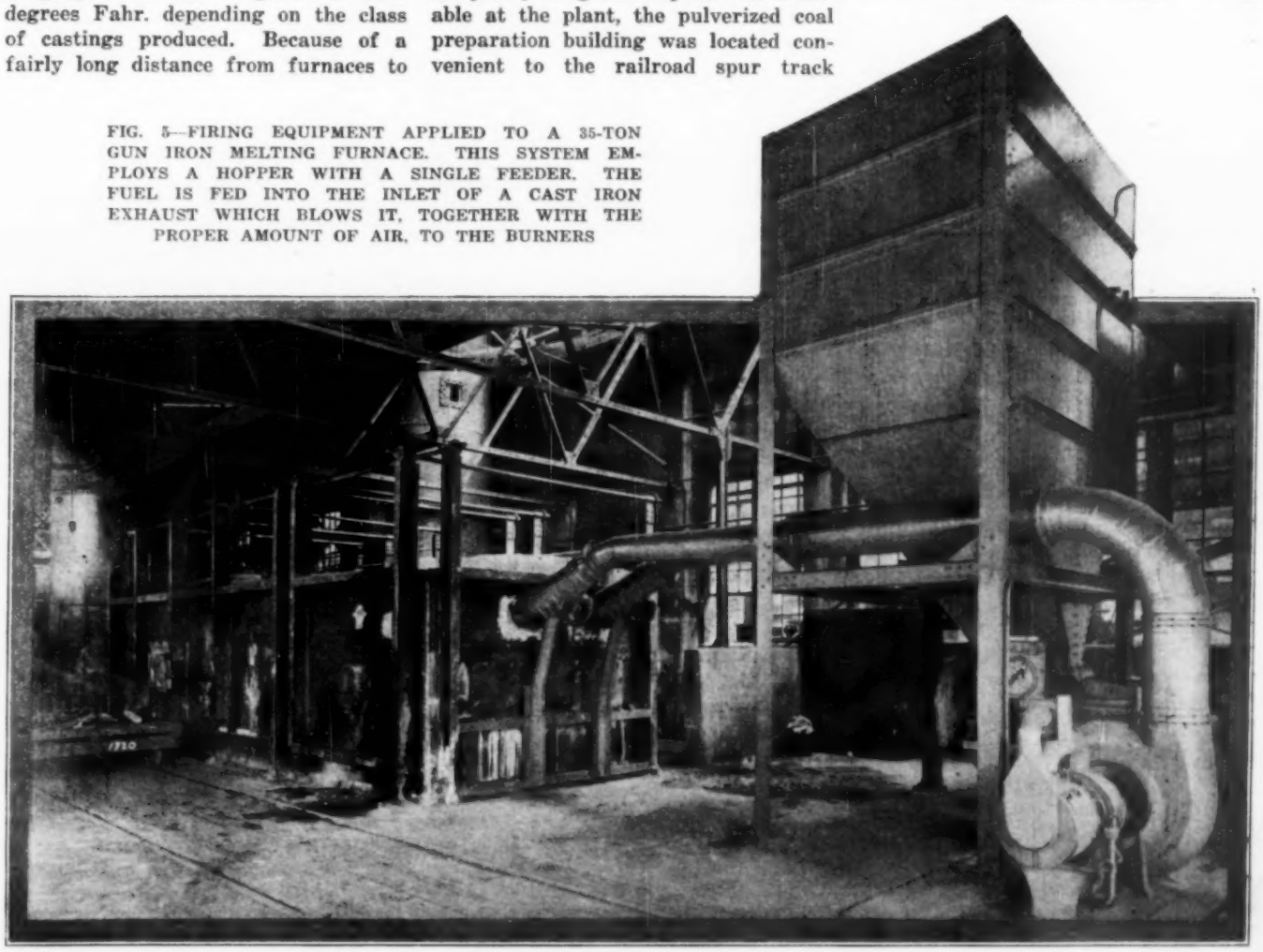


FIG. 4—INTAKE END OF A 10-TON MULTIPLE TUBE DRYER. THE LADDER LEADS TO THE TOP OF A 30-TON STORAGE HOPPER. THE PLATFORM BENEATH THE DRYER SUPPORTS THE EXHAUSTER. THE WALL AT THE REAR IS OF FIREPROOF CONSTRUCTION AND SEPARATES THE DRYER FROM THE PULVERIZING EQUIPMENT

These briefly were the conditions which the powdered fuel engineers found when starting to prepare the plans for the new installation in 1923. As plenty of ground space was available at the plant, the pulverized coal preparation building was located convenient to the railroad spur track which enters the property. This building is shown in Fig. 1. Coal can be loaded from cars direct into the receiving hopper, or can be taken from the storage pile by portable conveyor as desired. The portable conveyor may be seen at the right of the building.

From the receiving hopper a steel

FIG. 5—FIRING EQUIPMENT APPLIED TO A 35-TON GUN IRON MELTING FURNACE. THIS SYSTEM EMPLOYS A HOPPER WITH A SINGLE FEEDER. THE FUEL IS FED INTO THE INLET OF A CAST IRON EXHAUST WHICH BLOWS IT, TOGETHER WITH THE PROPER AMOUNT OF AIR, TO THE BURNERS



apron conveyor carries the coal to a single roll crusher where it is reached to lumps from 1 inch to 1¼ inches in diameter. The output of this crusher is discharged onto a bucket elevator which discharges onto a conveyor belt and the material then is passed over a magnetic pulley to remove the tramp iron. The coal thus cleaned of iron drops into a 40-ton hopper located over the dryer. The feed from this hopper to the dryer is by motor-driven screw feeder equipped with variable mechanical speed control.

The intake end of the dryer is shown in Fig. 4. This is a 10-ton multiple tube Grindle-type dryer driven by a 15-horsepower motor, and is fired by pulverized coal. Above the dryer in the illustration may be seen the 30-ton storage hopper for undried coal. The brick wall in the background is the fire wall separating the dryer from the pulverizing equipment and required by the national board of fire underwriters.

The drier is designed to remove the moisture to 1 per cent or less and has a capacity of 10 tons an hour. Recording thermometers indicate the temperature of the coal leaving the dryer and the temperature of the gases where they come in contact with the coal. From there it is possible to secure a uniform discharge temperature.

Six-Roll Crusher Is Used

The dried coal, which is still in lumps ranging up to 1¼ inches diameter, is fed by an elevator to the top of a six-roller, high-side pulverizer with a capacity of 5 tons an hour. This, it will be observed, is only half the capacity of the dryer. The plant is designed, however, for two pulverizer units which eventually will bring the pulverizing capacity up to the dryer capacity. The coal, which leaves the pulverizer, has the desired flour-like fineness, and now is ready to be used in the furnaces. Tests have shown that satisfactory results are obtained when 83 per cent of the coal passes through a 200-mesh sieve. The Hunt Spiller powdered fuel plant, as now operated, uses coal 99 per cent of which will pass through a 100-mesh screen and 90 per cent through a 200-mesh screen. The moisture content is kept from 0.5 per cent to 1 per cent.

The rest of the equipment consists chiefly of storage bins, air compressors, conveyor pipes, regulating valves and burners. A central hopper for storing the pulverized coal has a capacity of 20 tons. Above this hopper is a cyclone separator where the coal and air are separated. Fig. 2 shows this hopper with the main steel pipe line of the conveyor system running off to the left. This system with a capacity of 1000 pounds per minute, operates pneumatically without moving parts, and supplies fuel to the various furnaces, each of which is provided with a small individual hopper such as shown in Fig. 5. The conveyors operate at about 25 pounds air pressure and consume 500 cubic feet of air per ton of coal. The cost of the operation of the entire conveyor and blower system is said to be from three to four cents per ton of coal.

Flame Characteristics Vary

In operation the melter determines the nature of the flame by its appearance and makes the necessary adjustments by changing the flow of air or of powdered fuel or of both. Sometimes, due to condensation of moisture between the drier and the furnace, the powdered coal is not as dry as desired, and when this is the case the flame has different characteristics which are readily discernible by the melter, who then makes compensating adjustments. It is, in fact, the ease of control of the flame which makes it possible for the melter to maintain within small limits the exact temperature curve desired and thus to produce a uniform product.

Fig. 5 shows a typical furnace unit with its bin and burners. The dial seen at the base of the bin is for regulating the supply of powdered coal. The air is regulated by an air gate on the inlet of the exhauster. As the coal leaves the bin, it first comes in contact with a stream of air and then passes to two carburetors where the mixing of air and coal is completed. This mixture then is carried up through the pipe shown in the illustration to the Y directly in front of the furnace where it is separated and enters the furnace through two burners. Combustion practically is complete within 9 feet of the burner mouths.

Waste Heat Boiler Is Provided

In addition to the six air furnaces, the powdered fuel installation has been extended to include a 466-horsepower waste heat boiler. This boiler, which is shown in Fig. 3, is of the horizontal water tube type with a cross drum in the rear and combustion chamber extended at the front of the boiler. Its combustion chamber is 15 feet, 9 inches from the front tubes to the bottom of the ash pit. In normal practice it is fired by waste heat from two of the melting furnaces, but there are times when it is desired to run it separately and then the powdered fuel is used.

The complete plant, installed by the Grindle Fuel Equipment Co., Harvey, Ill., was first put in operation in March, 1924, and after 10 to 11 months' operation several results of the change are definitely established. The capacity of each furnace has been increased to 40 tons per melt due to the elimination of the grate and the consequent increase in length of the bath. The coal consumption has been decreased, and at present averages close to three parts coal to one of iron. The cost of bricks has shown a decrement, and the labor charge practically has been reduced one half for one man now takes care of each furnace compared with two men when hand firing was employed.

British Plan Meeting

The annual autumn meeting of the Institute of Metals will be held in Glasgow, Scotland, Sept. 1-4. This is the first meeting to be held in Glasgow for 15 years and it is expected that the attendance will be large, including many visitors from overseas who may be in Great Britain in connection with the British Empire exhibition. A reception committee has been organized and is presided over by Lord Weir of Eastwood.

In the evening of Sept. 1 the fourth annual autumn lecture will be delivered by Sir John Dewrance, vice president. On Sept. 2 and 3, the morning session will be devoted to the presentation of papers for discussion while the afternoons will be devoted to visiting the leading engineering works of the region. A sail down the River Clyde to view the industrial section will take place Sept. 3. In the evening the members and visitors will be entertained and on Sept. 4 there will be an all-day tour visiting Loch Lomond, Loch Katrine and the Trossachs. For the convenience of applicants for membership who are desirous of being elected in time for the meeting, a special ballot is being arranged, in connection with which membership application forms should be received by the secretary, G. Shaw Scott, 36, Victoria street, London, S.W.1, before June 30.

A joint convention will be held by the Association Technique de Fonderie de France and the Association Technique de Fonderie of Belgium at Liege, Belgium, Oct. 4-7. On Oct. 6 and 7 a trip will be organized in the Grand Duchy of Luxemburg to visit the iron and steel districts and foundry plants in that country.

How and Why in Brass Founding

By Charles Vickers

Attacked by Porosity

We have had an unpleasant experience with porosity while making some small and simple red brass castings. We are sending samples showing the difficulty. You will note the castings are filled with many small holes, and we will appreciate your advising us as to the cause.

We may hazard a guess as to the cause of the porosity because we know nothing of the conditions under which the castings were made. An examination of the castings reveals there may be more than one cause of the porosity. The small cap carries only one blowhole. If it was cast from the same heat as the others, this might be caused by bubbles coalescing. If not, it is due to the mold being too close, or too damp, not because the mold is not rammed right and the sand of the proper dampness, but because of the shape of the castings. Flouring the molds frequently removes this trouble, when it is not due to the metal. The other castings are porous all through, and the fracture looks as though the metal was oxidized in melting, but it is more than likely the reverse is true and that it is over deoxidized. If oil furnaces were used in the melting change the flame to make it slightly oxidizing, and use common slaked lime as a flux which will tend to produce sound castings of red brass.

The only way to make certain of the origin of the trouble is to put samples through a scientific investigation, analyses, and microphotographs. This eliminates guesswork and bares the facts in the case, and permits processes to be outlined that prevent a recurrence of such porosity.

Avoiding Blowholes

We make pure aluminum castings and find we have blowholes throughout the castings. Kindly advise us how to prevent these holes.

The cause of pits of holes in the aluminum or aluminum alloy is in the majority of cases caused by pouring the metal into the molds when too hot. Have the temperature of the metal as low as will permit; filling up the mold completely. It is a good plan to determine this point before starting production, by pouring a number of molds at descending temperatures, recording the temperature of each mold with a pyrometer. The lowest temperature that fills out the mold completely is the correct pouring temperature, and all succeeding heats can be poured the same. Never rely on the judgment of the eye in pouring aluminum alloys. The advertising columns of THE FOUNDRY will suggest where a pyrometer may be obtained.

Make Brass Bearings

We experience trouble in making brass bushings due to the fact of their being porous. This casting was made from a mixture of copper 50 pounds; scrap brass (valves and so forth) 40 pounds; lead 5 pounds; zinc 5 pounds; and as a deoxidizer we add two small blocks of phosphor copper.

The sample shows a perfect example of porosity in that the holes are uniform in size and are intercommunicating and extend throughout the entire casting to within about ⅛-inch of the surface chilled by the sand. An examination with a lens shows there is not a trace of oxide lining the holes, so we may dismiss the well worn theory of oxidation, and the necessity of deoxidizing the metal. We suggest the two small blocks of phosphor copper be omitted in a few heats, as the alloy mentioned does not need this deoxidizer. If the melting is done in crucibles in a coke-fired pit furnace, coke up the crucible to its top, and then set on top the bilge from a worn out crucible, made by chopping off the bottom of the old crucible with a hatchet. Have the bilge as deep as possible, in which connection a dome-shaped cover for the furnaces may be used. Charge into the empty crucible, first the scrap brass, and on top of this the scrap copper, then add a few blocks of hard wood. Using the crucible bilge, the entire heat may be put into the crucible cold. Let it melt and when it is all down remove the bilge, and give the charcoal covered metal a good stirring, then add the lead and zinc. Add more charcoal if necessary and run the fire to get the metal hot, then pull and pour, cooling as required. The castings will be sound if made in this manner.

Have Analysis Made

We make trailer truck brasses and would like to obtain an alloy suitable for such castings. The castings weigh 85 pounds each. We have used a mixture of all scrap consisting of driving box scrap and crown brass scrap, adding to a 400-pound heat about 30 pounds of copper to liven up the scrap. Some trouble was experienced with the brasses running hot and breaking, but it is our opinion there is too heavy a load on these brasses.

A standard bearing alloy for such brasses is 80 per cent copper; 10 per cent tin, and 10 per cent lead, with a little over 0.25 per cent of phosphor copper as a deoxidizer. When using all scrap metals the composition of the finished castings is unknown. It would be advisable in this case to have an analysis made of the metal in the bearings which failed. This knowledge is valuable and may be obtained at a reasonable cost. Unless the composition of the driving and crown brass scrap is known, an analysis of this scrap should be made. Having a knowledge of the composition of the metals in the bins, it is quite easy to make castings of a known and standard formula.

Using proper lubrication also is important to bearings. If this is neglected or improperly carried out there will be hot brasses and scored axles, no matter how suitable the alloy may be for bearings.

Yellow Brass Mixture

We would like to learn of a good mixture of yellow brass suitable for pipe fittings.

The following mixture may be used for gas fittings:

GAS FITTING MIXTURE

	Per cent
Copper	66
Zinc	31
Lead	3

The following mixture may be used for brass handrails:

BRASS HANDRAIL MIXTURE

	Per cent
Copper	68
Zinc	28
Tin	2
Lead	2

Bill Claims Confusion in Foundry Terms

BY PAT DWYER

ON THE evening of Decoration day the family had scattered in all directions after the manner in which the average family disintegrates immediately after the evening meal and I was left sitting alone on the veranda with my own meditations. 'Tis an easy and harmless method for passing the time. I had a pipe, a paper of tobacco and as nearly as I could calculate off hand a sufficient supply of matches to carry me over until the gradually gathering darkness forced some of the younger retainers to seek the shelter of the house. Then I would be in a position to offer a suitable prize to the one who could dash into the kitchen with the greatest speed and return with a fresh handful of the jolly old matches through which I might prolong the session.

I have no patience with lazy people and never miss an opportunity to encourage habits of speed and diligence in others. At times I am handicapped sadly in this laudable desire by the children's mother. She has intimated occasionally that example on my part would prove more efficacious than precept. Women have such peculiar notions regarding the manner in which a household should be conducted. I hold this lady in considerable esteem and would not for a moment think of flatly contradicting her. Intuition and experience gained over a period of many years has provided me with a satisfactory method of retreating with honor from one of these impassable barriers when it threatens to block the path of domestic harmony. When a fresh supply of matches is required I generously suggest that she show the children a shining example by procuring them for me with her own fair hands. I regret to say that up to the present she has refused to admit the validity of the argument. When she is one of the happy little family circle I have to get my own matches.

Some day when I have the necessary financial resources and if I happen to think of the subject in time I shall purchase a box of matches for my own private use and display it ostentatiously several times each evening. Every worm has a kick or two in him if he is pushed far enough. I may have this proverb mixed but you know what I mean.

However, what's the use of anticipating trouble? I knew an old Scottish molder one time who summed the situation up neatly on occasions of this kind by saying it is time enough to shake hands with the devil when we meet him. He was a friendly old lad —the molder—a bit addicted to the drink and a passionate devotee to a little old black clay pipe, but as they say over in his native land, the root of the matter was in him and he was a true if slightly profane and illiterate philosopher. The Scotch are a great people with a nice and discriminating taste in many things.

On this night of which I speak I smoked away in peace for some time with my mind running idly over some of the scenes I had seen in the day's parade. Apparently at least one other person in the neighborhood was tuned in on the same wave length. He or she had started a graphophone on a record I had not heard for years. In poignant ecstasy I listened to the old familiar strains of *The Boys of the Old Brigade*. The old boys, the true boys, the boys who marched steadily shoulder to shoulder, steadily blade by blade—the boys who now sleep in old England's heart.

Association of ideas carried me back in imagination over a period of many years to moonlight sleigh rides with a band of choice and rollicking young spirits who woke the echoes joyously along many a lonely country road. Snugly wrapped in buffalo robes, sitting in delightful proximity to a fair young maiden scented like the garden of Allah, the natural timidity of youth vanished like dew before the sun and each gallant young hero lifted his voice blithely and joined in the chorus that floated away to the jingling accompaniment of the sleigh bells. Even the horses seemed to enter into the spirit of the thing.

Those old days are far away and long ago. The merry party long since has scattered like the brown leaves of October. Some are living in distant lands and others have been sleeping peacefully for many years in the haven under the hill. Listening to the old familiar strains the other night reminded me of Lord Ernle's beautiful passage on *The Power of the Psalms.*

"With a psalm we are married and buried; with a psalm we realize to the full, and end, our earthly existence. With what strange power do the familiar words of the Book come home to us as we grow older! Here are verses over which have stumbled forty years ago, the childish lips of brothers, severed from us by

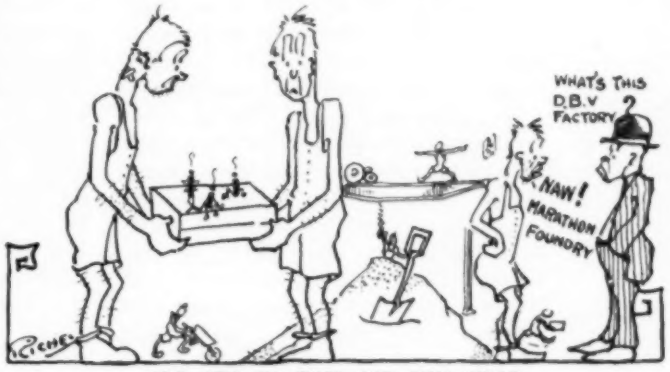
A MEETING OF PHYSICIANS LOCAL UNION NO 1?

years of change and absence, yet now, by the force of association with a psalm seated once more by our side in the broken circle of home. Here again is a passage which with trembling voice and beating heart, we read aloud by the death bed of one with whose passing the light faded and our own lives grew gray and void and lampless."

If I had been left alone I don't know into what depths of gloom and melancholy I might have drifted eventually, but fortunately Bill arrived on the scene and rescued me as I was going down for the third time. Noting the languid and preoccupied manner in which I responded to his noisy greeting he advised me, somewhat rudely I thought, to snap out of it. "Cheer up me lad," said he. "All is not lost even if you are afflicted with the pip or housemaids knee or if you suddenly have discovered that you are one of the five doomed to walk alone like Kipling's cat on account of halitosis. Here folks," said he, striking an attitude and holding his right hand aloft. "Here folks, between the index or first finger and thumb of my right hand I hold a small pellet no larger than a pea. It is compounded according to a secret formula in the possession of my family for many generations. Compounded from the essence of healing gums, roots, berries, barks and balsams. Nature's own remedy spread so prodigally over the face of the earth by the hand of God himself to nourish and invigorate suffering humanity. It contains no drugs. It is absolutely harmless, tasteless, scentless and carries with it none of the nauseous after effects of quinine, ipecac, nux vomica or castor oil. It may be taken with equal assurance by those in the prime of life, by those who are just embarking on the long journey and by those who slowly are approaching the western portal. These pellets, folks, now will be passed among you by my assistant. They are put up in packages finished in the four natural flesh colors white, yellow, brown and black, but the price remains the same to one and all, 25 cents for a single package or five for one dollar. Kindly have your change ready.

"I don't know how to classify you," said Bill, as he planted himself in a chair and cocked his feet up on the veranda railing. "You certainly are not an innocent prattling little child. Far be it from me to intimate that you are approaching a period of aged senility, but basing an opinion entirely on the sad sea waves expression on your countenance I should say you are far from being in the prime of life. And that, if I may be pardoned the expression, is that. In other words, what's biting you?"

"Your remarks," I said, "are decidedly flippant, but nevertheless entirely welcome. In fact I might go further and admit they are just what the doctor ordered. Before you arrived I was plunged in the well known slough of despond thinking of the manner in which the friends of youth have disappeared."



ALL SET TO RUN OFF THE HEAT

"Pure waste of time," said Bill. "Brooding over the past never will get you anywhere. You put yourself in the same position as a moldy draggle tailed hen sitting on a china egg. The hen may be excused on the ground of natural limitations, but it is a poor example for a human being to try to emulate.

"However, talking of the manner in which people disappear I often have wondered what becomes of celebrities whose doings fill the front pages of the newspapers for a short or a long period and who then vanish utterly from the public ken. Their names are household words for a time and then they are dropped like a hot potato.

"Fifteen or twenty years ago more or less you could not pick up a paper without being confronted by a picture of Tom Longboat the famous Indian marathon runner. The country at the time was swept by one of its periodical crazes and marathon races were staged in every community where a sufficient number of people could be gathered to make the venture profitable to a select company of gentlemen who flourish on the credulity and gullibility of the public.

"The redoubtable Tom was the bright particular star and the great drawing card at a great many of these exhibitions of speed and endurance. He consistently distanced all competitors. Newspaper men and magazine writers vied with one another in singing his praises. Intimate stories were told and retold of his early days on the reservation and of the manner in which he had developed his body into the most perfect piece of running mechanism that ever traveled on two flying feet.

"Every boy and young man regarded him with a species of adoration and secretly regretted a heritage that denied them the advantage of being born on a reservation. They were familiar with the great runner's measurements up and down and fore and aft. They knew the length of his stride, his chest expansion and the capacity of the mighty lungs that functioned so smoothly and easily for such extended periods of time under grueling conditions. His most trivial remark was good for a column in a thousand papers scattered from the Atlantic to the Pacific. Easy money, association with the white man and the adoption of some of the latter's habits were Tom's final undoing. He began toying with the firewater and this ancient enemy of his race wiped him off the race track as effectually as it wiped the greater number of his people from the face of the North American continent.

His name appeared no more in the newspapers. Other celebrities occupied the front pages and so far as Tom was concerned, no person ever had heard of him. Apparently no person knew whether he was living or dead. This condition partly was due to the fact that the fad for marathon racing had run its course and a fickle public had transferred its allegiance and interest elsewhere. Other factors also probably were responsible. His backers realized that a losing racer was no longer a drawing card and the publicity bureau was closed.

"As I said before, I often have wondered what becomes of famous characters when they slip their moorings and head for the Port of Missing Men. This is the only instance in which my curiosity finally was gratified. I visited a foundry in Buffalo a few weeks ago and saw a familiar figure pushing a wheelbarrow along the gangway. The easy grace and the long tireless stride were missing, but the features had changed only slightly since the last time I had seen him sliding in an easy winner to the tumultuous applause of a crowd in a New England city. I hardly could believe my eyes, but when I appealed to the manager for confirmation I was assured that the lad was indeed no other than the one time famous Tom Longboat, himself in person. Can you

beat that for an odd coincidence?

"At one time or another I have hobnobbed with many odd characters in the foundry. They seem to drift in from every walk in life. One of the best helpers I ever had was a man in middle life who held a master's degree from a noted European university. He was a highly cultured gentleman, but his weakness for strong waters had reduced him to a point where the only position he could hold was that of a common laborer. I was quite interested and at the first opportunity installed him as foundry clerk. He was a treasure and did his work beautifully—for a short time. Then he disappeared on a prolonged spree and when he returned professing repentance the best I could do was to once more introduce him to a shovel. Poor Malcolm, he eventually disappeared and never returned.

"I don't know whether or not the foundry outranks other industries in the number of odd, queer and freaky characters that may be found on the roll. Certainly it is an appropriate place to find curiosities. Some of the terms employed mean absolutely nothing to outsiders. One word may be applied in half a dozen different ways. For example you ask the average foundryman to explain the difference between an matchboard and a followboard.

"Like many other terms in the foundry these two have been applied loosely over a period of many years with the result that now they practically are synonomous. To the stickler for precision it may be said that the same applies to many foundry terms. No person except those directly interested in the foundry business ever makes use of these terms and since foundrymen usually can gather the exact meaning either through experience or through the context, no great amount of damage ever has been done by this seemingly aimless method of mixing the meaning of terms.

"For example consider the many applications of the word gate, or that other veteran, vent. A gate may mean a channel in the sand, or it may mean the metal that fills the channel It is used indiscriminately to describe either the horizontal or the vertical passage or any part of the metal that fills these passages. The strangest use of all is in connection with patterns. Where a considerable number of patterns are attached to a single runner the entire device is known as a gate of patterns.

"The word vent is employed in an equally indiscriminate manner and may mean any one of half a dozen different things. The opening through which the gas travels is a vent. The smoke or flame in the vicinity of the mold is called the vent. Small pencils of iron sometimes found attached to a casting are referred to as vents.

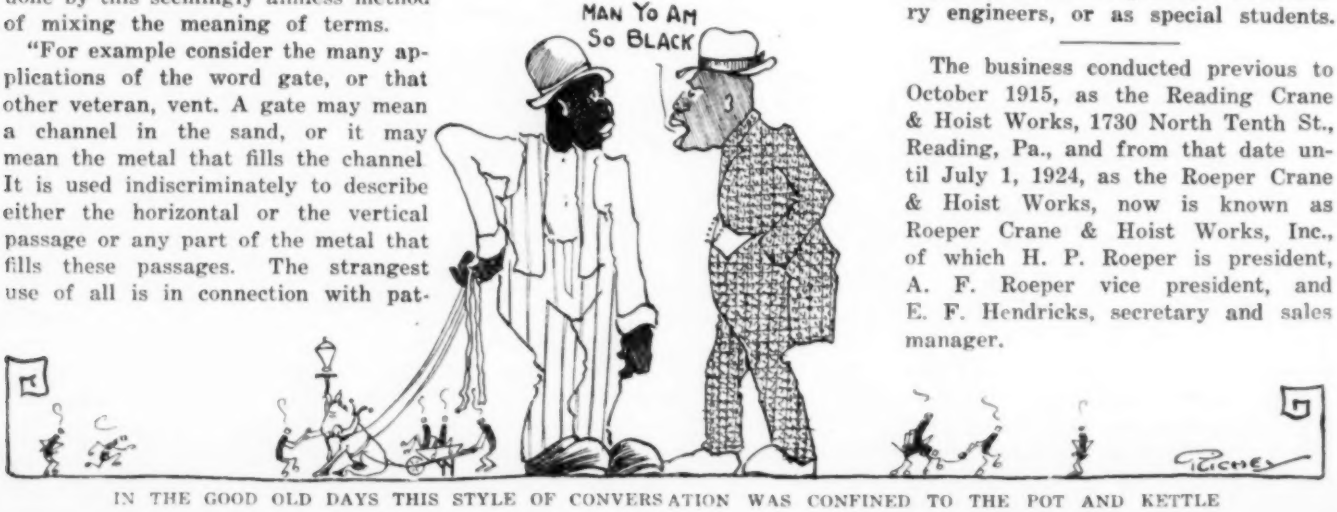
"The terms followboard and matchplate may be and usually are employed indiscriminately, still there is a real difference if the occasion arises to actually discriminate between them. They are alike in that each is intended to be used with patterns that extend partly into the cope and partly into the drag. They differ in that in the case of the matchboard both halves of the pattern are attached to the board, the drag half on one side of the board and the cope half on the opposite side.

"With a followboard the pattern is not split, the part designed to go in the cope fits into a suitable hollow in the board. The board is removed after the drag is rolled over, leaving the upper part of the pattern projecting above the joint. Its primary purpose is to save the time required in making a parting. Briefly it may be stated that the followboard is removed after the drag is rolled over while the matchboard remains in place until both cope and drag are rammed.

"In some cases for convenience in ramming or for other suitable reason the opposite halves of the pattern may be mounted on separate plates. The two half molds are rammed as separate units and afterward assembled. The boards or plates on which the half patterns are mounted are known as matchplates or matchboards.

"Reduced to its simplest terms and with a proper regard for accuracy, a followboard is nothing but a rollover board shaped on the upper surface to follow the contour of an irregular parting line. It is discarded after the drag is rolled over. The cope is rammed directly on the drag. A matchplate or matchboard which may be made either of metal or wood, serves to form the joint on both cope and drag. The drag is rammed on the board and the cope is rammed on the board, usually, but not necessarily the same board.

"Talking about the manner in which names are juggled I heard an illuminating conversion the other day between two gentlemen of color. 'Boy,' said the first, 'Yo' suttinly is black. Yo' name should be midnight.' 'Is dat so?' inquired the second, throwing an appraising eye over his friend. 'When it comes to givin' out names yo' ain't no mo' dan 5 minutes f'om 12 o'clock yo' self.' "



IN THE GOOD OLD DAYS THIS STYLE OF CONVERSATION WAS CONFINED TO THE POT AND KETTLE

Install Sand Testers

American sand-testing machines have been shipped to France for the *Ecole Superieure de Fonderie*, the school for foundry engineers, a description of which was given in THE FOUNDRY, April 1, 1925. The machines will be installed in the laboratory of the school, at the *Ecole Nationale des Arts et Metiers.*

The results obtained after the first year's activities have been decidedly good. The influence of the school is beginning to be felt even outside French boundaries. It is announced that the Universite du Travail of Charleroi, Belgium, will appoint a professor who will be a member of the staff during the coming year. The French railroad administration propose to designate foundry foremen to follow the course of studies, either as regular students to graduate as foundry engineers, or as special students.

The business conducted previous to October 1915, as the Reading Crane & Hoist Works, 1730 North Tenth St., Reading, Pa., and from that date until July 1, 1924, as the Roeper Crane & Hoist Works, now is known as Roeper Crane & Hoist Works, Inc., of which H. P. Roeper is president, A. F. Roeper vice president, and E. F. Hendricks, secretary and sales manager.

Recommend Microscope as *Control Instrument*

Physical Properties Will Meet Specifications if Microstructure Is Satisfactory—Gives Explanation of Solidification of Medium Carbon Steels

By J. Fletcher Harper and H. J. Stein

EXAMINATION of the structure of the castings with the microscope is being used to determine the proper conditions for annealing castings. That this method may be relied upon is shown by the fact that where the microstructure is satisfactory, the physical properties likewise are satisfactory. The method used by the Allis-Chalmers Mfg. Co., Milwaukee, is described in this paper, which was presented at the Milwaukee convention of the American Foundrymen's association, October, 1924. The authors are connected with the Allis-Chalmers Mfg. Co., Mr. Harper being metallurgist and Mr. Stein superintendent.

TO UNDERSTAND fully the process of annealing, it is necessary to state briefly the now accepted explanation of the solidification of medium carbon steel.

Above a certain temperature, which is from about 2732 degrees Fahr to 2192 degrees Fahr steel, depending upon the composition, is in the molten state. On cooling below this temperature, solidification begins about various centers, which are at the lowest temperature. This results in formation of crystal skeletons. The skeletons rapidly develop branches which

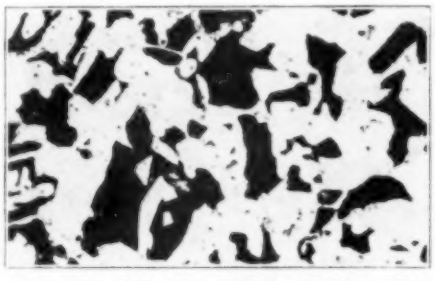


FIG. 1—TEST TAKEN FROM COUPON TEST BAR OF 1000 POUND STEEL CASTING AFTER ANNEALING

become more and more coated with crystallizing matter, until the whole resembles a tree. It is from this action that the term dendrite or tree-like is derived. The action is similar to the formation of rock candy in a sugar solution.

The formation of a single crystal in steel, is rare. Therefore, it must be considered that a number of these dendrites are forming until they interlock and the whole material is solid. This solidifying of steel from the molten to the solid state is called the *primary crystallization*, and it is during this stage that any nonmetallic particles are entrapped between the branches of the dendrites.

If the number of nonmetallic particles is great and the rate of passage from the liquid to the solid is relatively slow, the formation of dendrites is slow and these nonmetallic particles are trapped in streaks or lines between the dendritic branches. It is practically impossible to move nonmetallic inclusions by heat treatment short of fusion.

The above explanation of the mechanism of primary crystallization will explain the weakness at corners in dirty steel castings. The dendritic formations, proceeding from two surfaces, force the nonmetallics in the molten metal to their extremities, until when the dendrites interlock a plane of inclusions is formed.

While the metal has passed from the liquid to the solid state and now has shape, this metal, with the exception of the nonmetallic particles, must be considered as having a crystal grain but not having any individual constituents. This condition is known as a solid solution and the steel is said to be austenitic.

As the temperature of the steel,

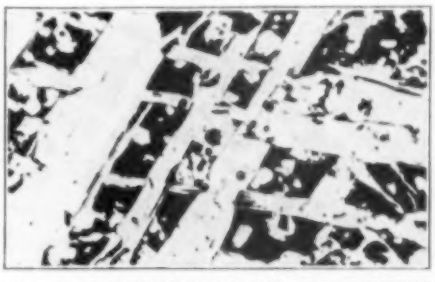


FIG. 2—PHOTOMICROGRAPH OF SECTION SAWED FROM CASTING WITH NO ADDITIONAL TREATMENT

varying from about 1652 degrees Fahr. to 1274 degrees Fahr., depending upon the composition, falls, another crystallization takes place. This is termed the secondary crystallization. It proceeds, in steel below 0.85 per cent carbon, by ferrite or iron content freezing out, until a temperature of approximately 1274 degrees Fahr. is reached. At this temperature the remainder, or the eutectoid, forms. The eutectoid is called pearlite and is made up of alternate layers of ferrite and cementite which has a composition of approximately 0.85 per

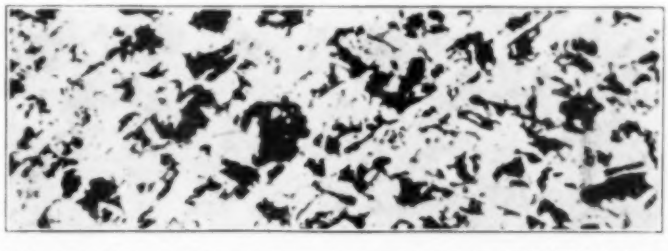
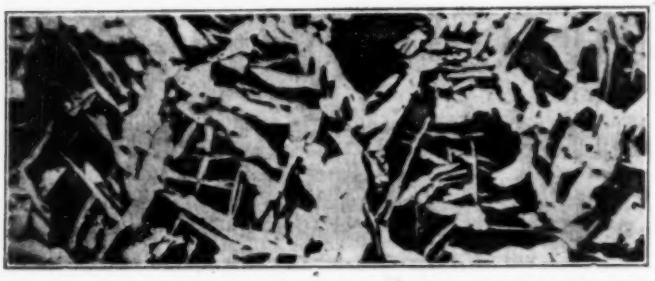


FIG. 3—SAME AS FIG. 2 AFTER FURTHER HEAT TREATING.

FIG. 4—PHOTOMICROGRAPH OF LARGE CASTING WEIGHING 20,000 POUNDS AS CAST



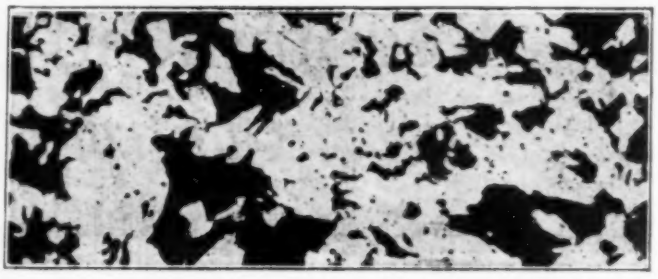


FIG. 5—AFTER HEAT TREATMENT SHOWING ENTRAPPED FERRITE. FIG. 6—PHOTOMICROGRAPH TAKEN AFTER REHEATING JUST ABOVE CRITICAL TEMPERATURE

cent carbon. Secondary crystallization may be considered as proceeding in three ways, causing three distinct structures in cast steel.

First, if the passage of the steel from the austenitic state through the critical temperature is slow and the size of the crystals not too great, the ferrite will form as an envelope or net work about the austenitic grains, leaving the pearlite as the cell or inner structure.

If the interval of secondary crystallization is covered rapidly, the ferrite grains will separate throughout the metal and will be parallel to the crystallographic planes of the austenitic crystallization. This results in the well known Widmanstratten structure.

When the period of secondary crystallization is lacking, the proeutectoid element is thrown out parallel to the axis of the primary crystals. This formation is rare in steel, usually being in large crystals, but it is generally found in semisteel and white iron.

The primary crystallization formed and the nonmetallic inclusions grouped at the time of solidification are not affected by any of the commercial forms of heat treating. Therefore, the process of annealing medium carbon steels becomes the altering of the secondary crystallization. This is done by reducing the size of the two constituents, ferrite and pearlite, and the uniform distribution of one constituent in respect to the other.

Offer Little Resistance

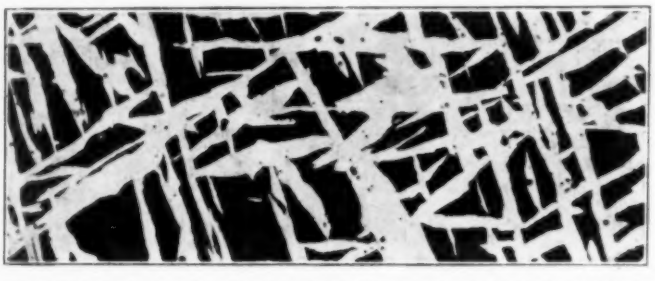
The reason for this redistribution is that the large grains, the splines, or the needle-like Widmanstratten structure of the cast metal offer little resistance to the path of the fracture.

Due to the manner of cooling from the austenitic range at the time of casting, the concentrations of the various elements are nonuniform. Therefore, it becomes necessary to heat above austenitic-ferrite (Ac_3) thermal critical temperature for resolution of the elements ferrite and pearlite.

The higher the temperature above this point of solution, the more rapid is the equalization of the concentration. At the same time the higher the temperature, the larger is the grain growth; so that a limitation is placed upon this equalization by increasing the temperature. There is also the additional disadvantage of an approximation of the three types of secondary crystallization again forming on cooling.

The ideal way to equalize the concentration would be by prolonged heating at just above the critical temperature. In large castings this time requirement is not commercially practical; so that an intermediate course is more satisfactory. This consists of holding at a temperature 100 degrees Fahr. to 200 degrees Fahr. above the critical temperature, for a moderate time followed by as rapid cooling to below the critical temperature as the variations in section of casting will allow. This rapid cooling is to retain the constituents in as uniform concentration as possible and to prevent their segregation during the interval of cooling. This treatment should be followed by a reheating to just above the critical temperature to reduce the grain size.

An additional treatment which greatly increases the ductility was described by R. S. MacPherson and one of the authors in a paper, read before the American Society for Steel



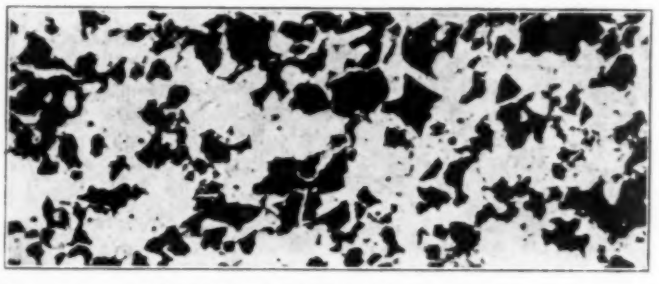


FIG. 7—PHOTOMICROGRAPH SHOWS WIDMANSTRATTEN STRUCTURE. FIG. 8—COMPLETE BREAKING UP OF WIDMANSTRATTEN STRUCTURE

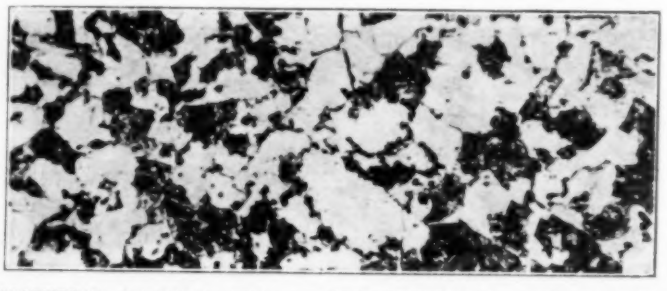


FIG. 9—PHOTOMICROGRAPH OF SECTION OF STEEL CASTING OF MATERIAL AS CAST. FIG. 10—SAME SECTION OF STEEL CASTING AFTER TRIPLE HEAT TREATMENT

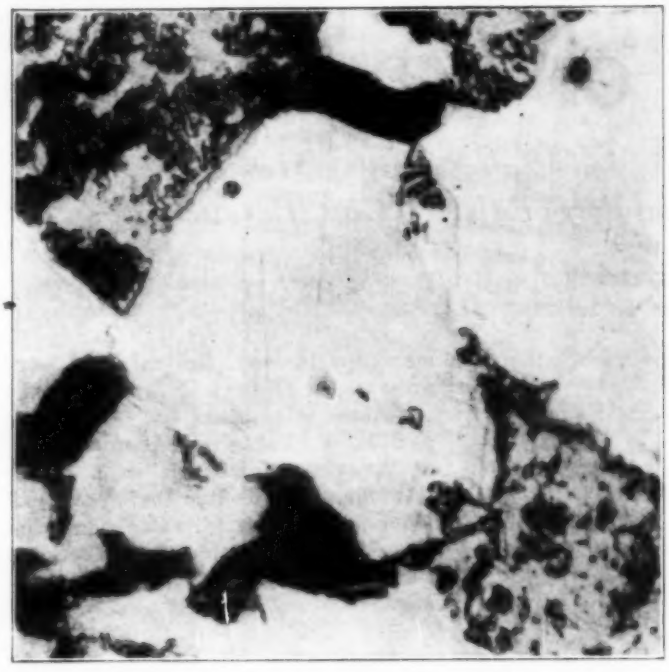


Fig. 11—View of a portion of section shown in Fig. 10 but taken at 1000 diameter magnification

Treating, held in September, 1923.

This treatment has the spheroidizing of the cementite of the pearlitic constituent for its purpose. It was found that by reheating to a temperature at or slightly below that at which the eutectoid or pearlite forms for moderate lengths of time of five to eight hours, that the cementite of the pearlite spheroidized. This spheroidizing treatment causes the sections of the laminar cementite of the pearlite to be dissolved in the ferrite of the pearlite. The remaining portions of the cementite coalesce by surface tension causing globules of cementite to be formed. This form of the pearlite increases the obstructions to the path of rupture, reduces the areas of the brittle cementite, and hence increases the ductility.

In taking tests of cast steel where the casting is of large section the test bar to be representative should be drilled from the body of the casting. The reason for this is that the small section of a coupon bar, due to its casting and heat treating conditions, does not represent the casting.

The photomicrographs Series 1, Figs. 1, 2, and 3 illustrate this condition. These photomicrographs refer to a uniform section steel casting, weighing about 1000 pounds. Fig. 1 is a photomicrograph of a coupon test bar 1 x 1 x 6 inches cast on the casting after an anneal of 1600 degrees Fahr., held for eight hours. Fig. 2 was taken from a section sawed from the casting itself. Fig. 3 is of the same casting after further heat treatment. This specimen and tensile bar was drilled from the casting.

Series 2, Figs. 4, 5 and 6 is of a large casting weighing approximately 20,000 pounds. Fig. 3 was taken from casting before annealing. It shows that ferrite of one edge of a secondary grain and ferrite set within the grain itself. Fig. 5 was taken after the treatment to equalize the concentration and shows the entrapped ferrite caused by the rapid cooling from the high temperature. Fig. 6 was taken after the reheating to just above the critical temperature.

The casting shown in Series 3, Figs. 7 and 8 is small, being 1¾ x 3½ x 3¾ inches and weighing 5¾ pounds. Fig. 7 is the interior of one of the grains in the cast condition. It plainly shows the ferrite entrapped during the secondary crystallization within the grain in the characteristic Widmanstratten structure. Fig. 8 shows the complete breaking up of this structure with the simple treatment owing to the size of the piece.

Series 4, Figs. 9, 10 and 11 is taken of a section drilled from a steel casting weighing approximately 12,000 pounds. Fig. 9 is of the material as cast. Fig. 10 was taken after the triple treatment and the ductility is found to be exceptionally great. Fig. 11 is an additional view of a portion of the section shown in Fig. 10, but taken at 1000 diameter magnifications. This view shows how the cementite of the pearlitic constituent has been spheroidized, which accounts for the great ductility.

Fig. 12 shows the slag streaks which are entrapped between branches of the dendrites in the primary crystallization and in this case completely outlining the dendritic formation. It is impossible to so equalize the concentration within the slag enclosed areas to properly anneal the steel. The slag areas are in streaks which cause the material to fail with low ductility.

All of the above photomicrographs were taken with a microscope after etching the polished specimen with 5 per cent solution of picric acid in alcohol. Photomicrographs, Figs. 1 to 10 inclusive, were taken at 100 diameter magnifications, using a 14 millimeter achromatic objective and a No. 1 2.6x projection eyepiece with bellows extension of 62 centimeters. Photomicrograph number 11 is at 1000 diameter magnifications, using a 4-millimeter aprochromatic objective, No. 3 10x projection eyepiece and 51½ centimeter bellows extension.

Photomicrograph number 12 is at 100 diameter magnifications, using

(*Concluded on Page* 502)

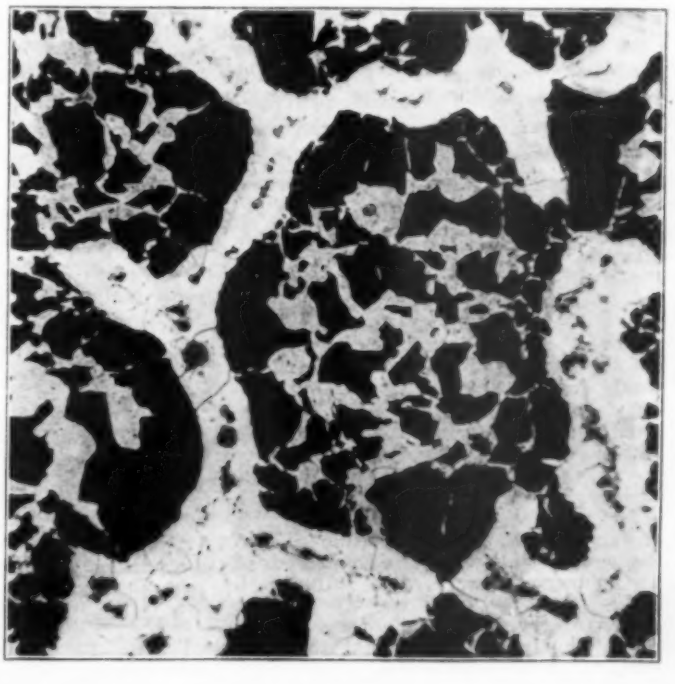


Fig. 12—Shows slag streaks which are entrapped between branches of the dentrites in primary crystallization

Defend Use of Castings

Foundrymen Attending Sessions of American Society of Mechanical Engineers Emphasize Service Possibilities of Cast Products

By E. C. Barringer
Chicago Representative, THE FOUNDRY

GENERALIZATIONS favoring forgings at the expense of steel castings, in papers and discussions at the spring meeting of the American Society of Mechanical Engineers at Milwaukee, May 18-21, were speedily and thoroughly refuted by foundrymen.

Typical of this alertness was the exception taken to the declaration of I. E. Moultrop, Edison Electric Illuminating Co., Boston, and E. W. Norris, Stone & Webster, Inc., Boston, in their paper, "The X-Ray Examination of Steel Castings," that steel forgings "have proved so reliable in actual service that the routine tests and analyses are considered entirely satisfactory proof of quality."

The resulting discussion developed the thought, that by the inference forgings were accepted outright and steel castings were subjected to the scrutiny of the X-ray, a cloud had been cast on the steel foundry product, but the authors of the paper disavowed any such intention and stated that the forgings in question were so placed that failure would not be disastrous while the steel castings were at key locations.

The steel castings figuring in the X-ray examination were for the Weymouth power station at Boston, where part of the steam power generating equipment operates at 1200 pounds steam pressure. The actual examination was conducted at the Watertown, Mass., arsenal. The conclusions reached as stated in the paper were:

In all, some 30 castings were examined for the high-pressure steam installation at Weymouth. Out of these only five proved seriously defective; the remainder were for the most part of extremely high quality. Through X-ray examinations it was possible to eliminate castings which would have been unequal to the service owing to flaws that were invisible from the surfaces, and to demonstrate with a reasonable degree of certainty the soundness and strength of the castings accepted. In this way the objectives laid out in the beginning of the examination were achieved and the cost of the work, if considered as an insurance charge, was fully justified.

The observations made form an excellent basis for a further study of the materials in this installation as affected by the conditions of service. The experience gained should be of value not only in the design of future installations, but also in cooperating with the foundries in eliminating the flaws found to be characteristic of certain designs and methods of manufacture.

F. C. Langenberg and H. H. Lester, both of the Watertown arsenal, predicted that within a year or two X-ray penetration of steel castings to a depth of 7 to 8 inches will be possible. A reservation on X-ray examination, to the effect the operator must be able to distinguish between defects and blemishes, was interposed by V. T. Malcolm and A. Sproat, Chapman Valve Mfg. Co., Indian Orchard, Mass. They declared that such defects as entrapped gas or blowholes, sand and dirt inclusions may be eliminated by close study and careful attention to details of foundry practice, while cracks, pipe and cavities can be controlled by proper design.

While the X-ray is unexcelled for studying repetitive operations, its cost precludes its widespread use for inspection, said F. H. Morehead, Walworth Mfg. Co., Boston. A. K. Fisher, Schutte & Koerting Co., Philadelphia, cited two chief uses for the X-ray: For castings of which only a few are to be made but which must stand high pressures; and where great numbers are to be made and investigation is possible before quantity production is started.

John T. Norton, Massachusetts Institute of Technology, Boston, observed that aside from the opportunity which the X-ray gives of determining such things as blowholes, seams, cracks, sand inclusions, etc., there is another adaptation which is becoming of great importance. This is a method of examining metals for their crystal structure. Apparently, many of the physical properties of metals, such as ductility and hardness, are closely related to the arrangement of the atoms in the structure of the metal and the X-ray method of crystal structure examination gives another means of studying these properties.

Data on the mechanical properties of aluminum alloys for sand, permanent-mold and die castings were presented by Robert L. Streeter, United States Aluminum Co., Pittsburgh, and P. V. Faragher, Aluminum Co. of America, Pittsburgh, in a paper, "Aluminum and its Light Alloys." Hans Dahlstrand, Allis-Chalmers Mfg. Co., Milwaukee, said in a paper, "A Review of Steam Turbine Development:"

The use of cast steel in place of cast iron for the high-pressure, high-temperature sections of a steam-turbine cylinder began with the advent several years ago of superheats producing steam temperatures of 500 degrees Fahr. or more. Cast steel still is employed for the cylinder or stationary parts for the highest temperatures now used, but in the author's experience it has been found of great value to heat-treat these cast steel parts for 700-degree service in a manner which results in a structure of the material itself that is more stable for long service. It has further developed that the expense of annealing the cast-iron parts of the major sizes of turbines is warranted, and adds to the assurance that the turbine, as a whole, will be made up of parts whose shapes and dimensions are stable. The research engineers of the company with which the author is associated found that the heat-treating of cast-steel parts, and the annealing, in a proper manner, of cast-iron parts called for investigations not covered by published information. The work on the annealing of cast iron was of especial interest and has been published separately. * * *

It is well known that cast iron maintains its tensile strength up to a comparatively high temperature, and from this fact it appears that this material is suitable for a considerably higher temperature; but cast iron gradually changes, increasing in volume even when exposed to comparatively low temperatures over long periods of time, and therefore is not suitable except for low temperatures. It is probable that other materials now considered suitable for high temperatures, or new materials now being developed, will have similar characteristics when exposed to high temperatures over long periods of time, and therefore it is important that this characteristic of the material be investigated thoroughly. Undoubtedly the heat-treated materials must be tested to see if, at comparatively low temperatures, the physical characteristics will change gradually. Therefore, it is obvious that a great deal of research and investigation are needed

before we can, with full confidence, go ahead with the construction of machinery for power plants using temperatures appreciably higher than those now being used.

Discussion on the paper of R. A. Bull, director of the Electric Steel Founders' Research Group, Chicago, published in THE FOUNDRY of June 1 and June 15 and outlining an ideal foundry organization, centered on the observation that "the only practical means of safeguarding against the exercise of poor judgment in the examination of castings for shipment is to place the chief inspector completely under the jurisdiction of a company executive who is not as readily influenced to form judgment from a restricted viewpoint as is the average superintendent."

Dissenters made the point that an inspector was not fully qualified to exercise sound judgment unless familiar with the pouring of the casting and that the superintendent on this account should sit in on final judgment. Mr. Bull added that his theory was that the chief inspector should always be present when important castings are being poured.

A. B. Segur, industrial engineer, Chicago, urged foundrymen to make extensive time studies of various foundry operations to place wage rates on a more scientific basis.

Opens Western Manganese Steel Plant

A NEW foundry for the manufacture of manganese steel castings has been placed in operation at Los Angeles by the American Manganese Steel Co., Chicago Heights, Ill. This plant is the most recently established unit of a chain of six foundries now owned by this company, the others being at Chicago Heights, Ill., New Castle, Del., Oakland, Calif., St. Louis and Denver. The organization has facilities for producing about 25,000 tons of manganese steel castings annually. The Union Iron Works, San Francisco, fabricated and erected the building. The melting furnace was built by the Pittsburgh Electric Furnace Co., Pittsburgh.

A car type, top-fired furnace made by the Mahr Mfg. Co., Minneapolis, is used for heat treating the finished castings, along with a quenching tank manufactured by the Western Pipe & Steel Co., Los Angeles. Erection of this furnace as well as the core-ovens and other furnaces was under the direction of E. W. Ekstrand, consulting engineer. Each furnace uses oil for fuel.

A 300-ton hydraulic press for straightening has been installed, which was built by the Southwark Foundry & Machine Co., Philadelphia, and a heavy duty welder made by the General Electric Co., Schenectady, N. Y., is used. There are three jolt and squeeze molding machines on the molding floor made by the International Molding Machine Co., Chicago and in the coreroom, two jolt machines made by the Herman Pneumatic Machine Co., Zelienople, Pa. These, with a sand mixer manufactured by the National Engineering Co., Chicago, aid in attaining maximum output. Production will be at the rate of 100 tons a month when working full capacity. General equipment consists of the necessary machine tools for a mechanical shop and a 500-foot compressor built by Ingersoll-Rand, New York.

For a number of years, the American Manganese Steel Co. has been making manganese steel castings by the electric furnace process at Chicago Heights, Ill., and Oakland, Calif. More recently, an additional foundry was acquired at Denver, Colo., where two, 1½-ton, electric furnaces especially adapted to the making of manganese steel have been in operation for some time. In addition to the electric melting units, the Denver foundry has all the necessary heat treating plant, molding and coremaking equipment, modern cleaning, grinding and straightening machines.

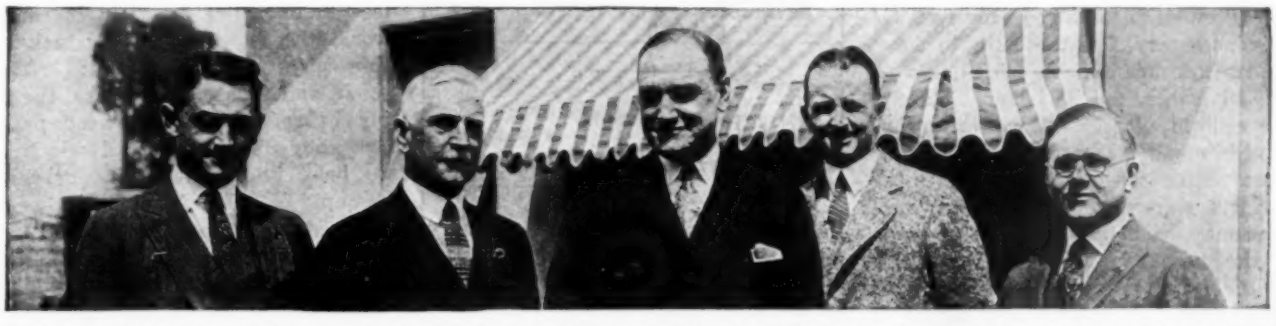
The foundry at New Castle, Del., also has been completely electrified during the past months. The company also operates another manganese steel foundry at St. Louis, Mo., under the name of the Southern Manganese Steel Co., which unit is also being equipped with electric furnaces.

Awards General Contract

A general contract covering design, erection and equipment, has recently been awarded the Austin Co. of Cleveland by the G. A. Gray Co. of Cincinnati. The Gray company was started about 1860 by George A. Gray Jr., in an unpretentious building on Sycamore street. A two-story office building is designed to carry additional floors, contemplating future development. A boiler house foundry and machine shop will be placed under one roof. The completed plant will contain approximately 600 tons of structural steel.

Delivers Annual Lecture

The fifteenth annual lecture was delivered before the Institute of Metals, London, on May 6 by Prof. H. A. Lorentz, Haarlen, Holland, the subject of the lecture being "The Motion of Electricity in Metals." On May 4 a ballot for the election of members for the Institute of Metals was taken and resulted in the addition of 53 persons to the membership roll. The recent election brings the Institute's total membership to 1614, of which 387 members reside outside the British Isles.



From Left To Right—Robert Miller, Vice President and General Manager, Union Iron Works, Los Angeles; Horace G. Miller, President, Union Iron Works; Wesley G. Nichols, President, American Manganese Steel Co.; D. H. Young, Western Manager, American Manganese Steel Co.; and A. W. Daniels, General Sales Manager, American Manganese Steel Co.

Marking Patterns Carefully
Keeps Records Straight

Letters and Figures Serve To Identify Patterns—Various Methods Now in Use for Placing Nameplates and Other Lettering on Patterns

By Walter C. Ewalt

LETTERS and figures are used by the patternmaker to describe the patterns as much as possible, giving information which will enable anyone, whether familiar with the patterns or not, to classify them. A plan of this nature is necessary where large numbers of patterns are stored. Stamping patterns is important, for often the parts for machines and other products are similar, and if not properly marked the patterns must be checked to find the correct one. Patterns also may be numbered, a good way being to use the same numbers as shown on the drawing, provided the numbers are short enough to be placed on small patterns. The various parts of the same product should be marked with the drawing number and with an additional letter, for example 784-784A-784B-etc.

On a split pattern, the marking may be done on the inside, and if possible on the cope, since this part receives the least wear when the pattern is in use. If the pattern is solid, it is best to stamp the title on the drag.

All pattern shops should have at least three sets of steel letters and figures of good quality. These sizes may be ⅛ inch for the smallest patterns, ¼ inch for the medium and ½ inch for the largest. A zinc strip embossed by being fed automatically through a type embossing machine, is simple, efficient and leaves a good impression in the mold. This embossed strip is used where it is desirable to have the name and number appear distinctly on the casting. However, if it is necessary for the title to have a neat appearance, the zinc strip is not advisable for it shows plainly. For certain classes of work, an engraved name plate has a pleasing appearance. Where the number of patterns warrant, an engraving machine may be obtained. This is made on the pantograph principle with a pointer which moves in a grove of a large figure or letter. The figure is cut in the wood or metal at a reduced size by a tong arrangement with a belt driven drill rotating at the end.

Perhaps, it is cheaper to buy letters than to make them if a raised name plate is wanted. The letters most commonly used are the sharp gothic. This type is preferred since it leaves the sand easily and takes up the least room. The sizes come from 3/32 to 4 inches in white metal and brass. A flat Gothic also is used, which is similar to the sharp Gothic except the face is broader. This may be secured in two styles, namely thick and thin, the last being preferable. The type is made in white metal or brass. Other types of letters used include round face letters and an oval face Gothic. The latter makes a nice appearing letter in steel castings, as it has a heavy section and makes a large impression in the sand into which the steel that is more or less sluggish, will run.

The Roman is a broad flat face letter. Many people prefer these for advertising, although this is a matter of taste. The hair line Gothic sometimes is called the skeleton Gothic. As the name implies, this is a thin letter and is suitable for small castings.

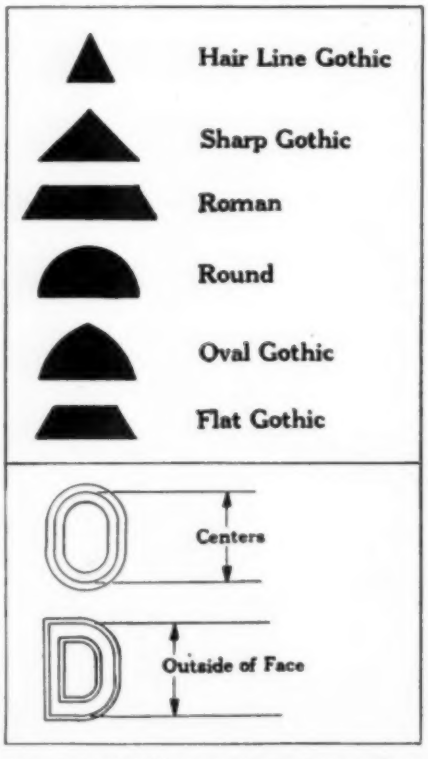


FIG. 1—RELATIVE SIZE OF THE TYPE.
FIG. 2—METHOD OF MEASURING THE FACE

Letters and figures should be purchased at the same place as they are cast in die molds, and if purchased from different manufacturers, there will be a slight difference in the size or style which will spoil the appearance of the plate. Aluminum letters and figures are made of a hard aluminum alloy to withstand usage, and may be fastened on either straight or curved work. The letters are made with several brads on the under side, the brads and letters being in one piece which may be attached permanently to the pattern.

Considerable expense and time often is taken by manufacturers in selecting a desirable style, form and size for advertising purposes. The approximate relative size of the different types of letters is shown in Fig. 1. The Gothic letters are measured from the center of the face and the Roman at the outside of the face as shown in Fig. 2.

After the style has been decided upon, it is a good plan to buy four or five sets of the alphabet, and the same quantity of numbers from 0 to 9, made of a soft alloy. These may be stuck on the wood patterns with brads or shellac for temporary jobs. This type of letter will nick easily and will not last long. A hot soldering iron placed on the letter hardens the shellac more quickly. For permanent work, the letters may be stuck on a thin piece of wood, about 3/32-inch thick, and then cast in brass, the casting being set into the wood pattern. An alloy should be used which may be bent into almost any curve, for example 85-5-5-5. Another method may be used to make a name plate which is to be placed on a compound curve. A hole slightly larger than the name plate is cut in the pattern and the bottom is made flat. A block of wood then is made to fit the hole and the

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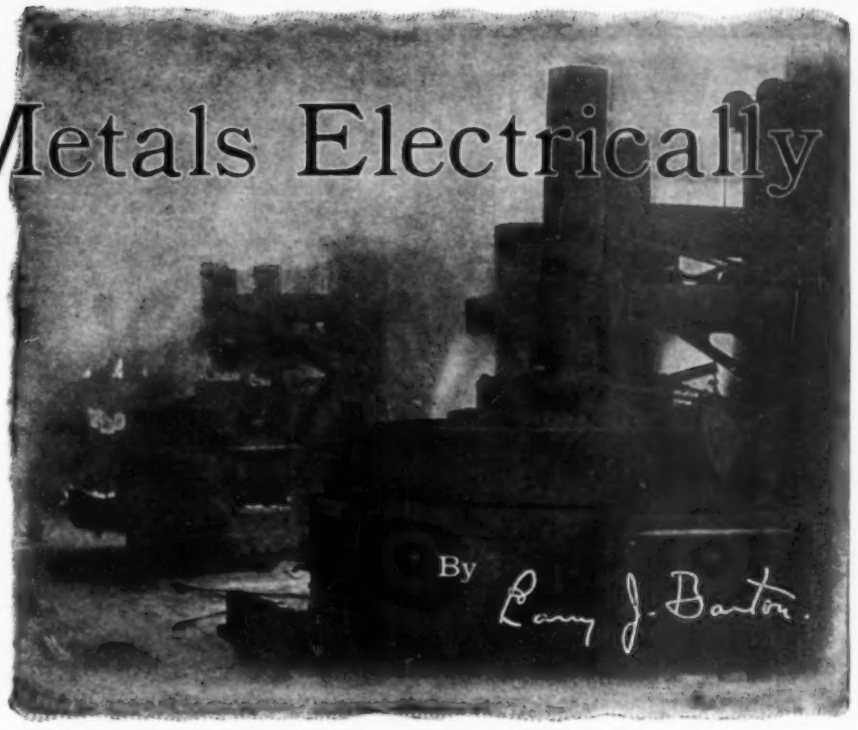
Refining Metals Electrically

Chapter VI (Concluded)

Melting Iron on a Basic Hearth —How Synthetic Iron Is Made



HIGHEST grade electric iron castings are made by melting cold stock on a basic hearth due mainly to the following reasons:

The metal may be more carefully charged according to class of scrap and analysis of metal.

The metal does not oxidize or burn during the melting down operation, requiring any bringing back.

The heat from the start is under a strong carbide slag allowing a greater period of refining.

For the highest grades of casting it is natural that the best possible grades of scrap should be used, and pig iron occasionally is charged for special heats. As the amount of machining to be done on the casting decreases, the cost of the heat is lowered by the use of steel. Thus by manipulating the charges of irons, varying compositions may be made from the softest, open-grain iron to that close-grained, hard iron containing 100 per cent steel charge.

The furnace operation is no different from that followed in the duplexing process, except that the slag mixture is added with the charge. A small amount of coke always is added to insure proper reducing conditions, and to take care of any slight amount of carbon which may be oxidized by the rust of the charge. Alloy additions, when necessary, are added near the end of the heat when the metal has been superheated sufficiently to insure proper diffusion.

Synthetic Gray Irons

SYNTHETIC cast iron, or iron made from a steel scrap base, found considerable use during the war. The use of such iron was founded upon sound economic reasons, caused in the main by prohibitive prices for cast iron scrap. With steel borings at such low prices as $5 to $8 a ton as against $40 to $45 for cast scrap, it was found that the cost of manufacturing synthetic iron in the electric furnace was considerably cheaper than the cost of producing cupola metal.

With war conditions over, further experiments were made on this synthetic iron to overcome certain difficulties in its manufacture. Synthetic iron as made in the electric furnace has properties differing widely from the ordinary cupola metal. Some of these are more favorable, while others are distinctly derogatory. Synthetic iron, and its properties may be briefly summarized.

Due to the uncertainties of its manufacture, this iron cannot be controlled closely in its physical structure. Consequently, one heat is likely to be exceedingly soft, while that following offers considerable difficulty to machining at high speeds. The result of this, is that synthetic iron finds small use for the better grades of machineable castings, where a uniform softness is desired. Its widest use is in those instances where a harder, yet machineable iron is required.

While synthetic irons cannot be machined at high speeds, they may be drilled easily, and find extensive use in such instances as the general run of car castings, where little machining is done.

Such irons contain unusually low percentages of phosphorus and sulphur. Consequently, they are much stronger and tougher than the high phosphorus cupola metal, which is a distinct advantage for certain classifications.

Synthetic irons are close grained, which is a distinct advantage especially on pressure castings. The silicons may be controlled closely, making easy the manufacture of irons of varying hardness.

In general such metal offers great advantages to any foundry and the natural result is that its use is rapidly increasing. In the manufacture of this metal but one point of difficulty is encountered. This is the care required to obtain a suitable carbon content. When a heat of steel scrap is

Ingredients Count

SYNTHETIC iron is a term which conjures to the fancy a metal of wonderful attributes, made in general from any sort of waste raw materials. Interest during the past few years has centered on the possibility of using borings extensively to make metal from which castings might be poured directly. Those who have attempted this feat know too well the pitfalls which await the unwary. In the concluding section of his chapter on electric furnace gray iron, Mr. Barton tells specifically what may be expected from electric furnace metal. He traces the effects of the different elements encountered, advises when it will be possible to use low grade scrap and finally he gives in detail his experience in making synthetic iron from various classes of raw material. Recarburizing the metal is one of the most tricky problems encountered as will be noted from this article.

TABLE LVIII

Heat Log of Cold Gray Iron

The specification called for the softest quality of iron for high speed cutting. The iron analyzed: Carbon, 2.63 per cent; manganese, 0.54 per cent; silicon, 2.37 per cent; phosphorus, 0.43 per cent; sulphur, 0.013 per cent. The charge consisted of 14,000 pounds of cast iron scrap containing an average of 0.10 per cent sulphur. The time for the heat was 3 hours, while the current consumption was 570 kilowatt hours per ton.

6:30 a. m.

Current on. 400 pounds of lime-spar slag added with the charge together with 100 pounds, low ash coke, ground to wheat size.

7:00

Current off to lower an electrode. Load steady, and iron melting down fast.

8:30

Charge all melted, walls raked clean. Slag rabbled and small amount of coke added.

8:40

Metal test taken. Metal rather cold. Slag a dark gray, powdering in the air and strongly carbidic.

9:00

Previous metal test broken. The iron is a soft gray, giving every evidence of extreme softness. Small amount of manganese added to tighten the grain. Metal now medium. All conditions O. K.

9:05

Slag given a rabbling and 50 pounds fluor spar added. Small dusting of coke made.

9:10

Metal test taken. Metal hot. Slag perfect.

9:25

Previous metal test broken. Metal satisfactory.

9:30

Heat poured.

This heat was shanked from a bottom pour ladle. The metal as it poured into the molds was bluish and emitting sharp white flames. The heads dipped deeply showing perfect solidification and fluidity. The appearance of the castings was perfect, and when machined they showed considerably better in regard to small spots than a similar iron made in the cupola.

melted in conjunction with an excess of coke it would appear on the surface that the absorption of this carbon, in the presence of the large amount of superheated iron should be rapid. Yet, when the actual heat is made, it is found that such is not the case. Operating under ordinary conditions, such a heat will melt down at about 2.50 to 2.75 per cent carbon, regardless of the amount of coke present in the furnace. If the heat is held at high temperatures for a considerable length of time, this carbon gradually will raise until close to a figure of approximately 4.00 per cent above which the carbon cannot go, except at extremely high temperatures, held for long periods.

As cast irons to be in any degree soft, and readily machineable, should have carbon contents from 3.25 to 3.75 per cent, it may be seen that bringing the carbon content up these few extra points is the seat of difficulty. As the absorption of this extra carbon must also be an economic proposition further obstacles are encountered. With this idea in view, of determining methods of quickly and cheaply raising the carbon content, many experiments have been made. The bureau of mines in Seattle, Wash., the author in Los Angeles, Calif., W. L. Morrison in Seattle, and many others both in this country and abroad have worked on this proposition, independently, but following the same general trend, and with practically the same results. Briefly enumerated the results obtained are as follows:

Regardless of the amount, or the class, of the recarburizer used it is seldom that the iron will, on the melt down, contain more than 2.75 per cent total carbon.

A low ash recarburizer is more effective in further raising this carbon than one of a higher ash content.

Recarburizers which are heavy, and sink low in the metal, such as graphite and petroleum coke, are more effective than those which float high on the bath such as charcoal or porous coke.

Time and temperature are two main points determining the amount of carbon absorption.

Slag on the metal greatly lowers the amount of absorption in a given length of time.

Rabbling the metal is a great

TABLE LIX

Logs on Heats Made from Iron Borings

FIRST HEAT

The charge at the start consisted of 500 pounds of shell rings, 2400 pounds of borings, 100 pounds coke and 25 pounds of lime.

The current was on at 8:05 a. m. Rabbled banks at 8:30, 8:55, 9:30 and 10:15 a. m. Bath was ready at 10:30 for remainder of the charge. Additional borings totaling 1600 pounds charged.

10:50

Carbide slag put on.

11:00

70 pounds 50 per cent ferrosilicon added.

11:15

Heat poured.

Total time for heat: 3 hours, 10 minutes. Total charge 4570 pounds. Kilowatt hours per ton, 569.

Note: 500 pounds of metal was left in the furnace for the second heat instead of charging shell rings. If carbide slag had been allowed to act longer the silicon content would probably have been a little higher. The analysis of the iron showed. Total carbon, 3.49 per cent; graphitic carbon, 2.89 per cent; silicon, 220 per cent.

On this heat a thin plate about ⅝-inch section, 12 x 18 inches ribbed on the under side with ¾ x ¾-inch ribs and having a large number of ¼-inch holes on 1-inch centers in both directions was poured. Also a can was poured weighing about 25 pounds and with a section ¾-inch thick. These castings were broken to show the fracture and were then taken to the machine shop, where they were filed, chipped and hammered, and the working qualities pronounced perfect.

SECOND HEAT

The metal left in furnace totaled about 500 pounds. To this 4580 pounds of borings, 150 pounds of coke and 30 pounds of lime were added. A part of the boring, 1000 pounds, was charged then the coke and lime, and then about 500 pounds more of borings. The remainder of the charge was added in two lots as the charge melted down. The heat was rabbled several times to clean the walls.

11:40 a. m.

Current on.

2:35 p. m.

Carbide slag put on.

2:50

75 pounds ferrosilicon added.

3:20

Heat poured.

Total time, 3 hours 50 minutes.

Kilowatt hours per ton, 524.

The analysis of metal showed a total carbon of 3.52 per cent; graphitic carbon, 2.77 per cent; and silicon, 2.61 per cent. Melting loss on both of the two heats was 2.76 per cent. Electrode consumption, 10 pounds of graphite electrodes per ton. The heats were made in a 3-ton Ludlum basic lined furnace for a test on its applicability for gray iron.

Heat made in a 6-ton Heroult furnace

The charge consisted of 15,500 pounds of cast iron borings.

5:30 p. m.

Current on. From this time until 7:00 the remainder of the charge was shoveled into the furnace as fast as possible.

7:00

As soon as melted the walls were scraped clean of hanging metal, and the remainder of this scrap shoved into the center of the furnace under the electrodes.

8:00

Metal nearly all melted. Test taken for chemist, and walls finally cleaned.

8:10

150 pounds lime, 50 pounds spar, and 100 pounds ground coke added, well mixed.

8:25

Lowered current.

8:40

Chemist reports manganese, 0.60 per cent; silicon estimated at about 1.80 per cent. As silicon was desired at about 2.25 per cent, and manganese at 0.80 to 1.00 per cent, these alloys were added.

8:55

Heat poured.

The final analysis showed total carbon, 3.80 per cent; manganese, 0.91 per cent; silicon, 2.18 per cent; phosphorus, 0.42 per cent; sulphur, 0.041 per cent. Time for heat: 3 hours, 25 minutes. Kilowatt hour per ton, 520.

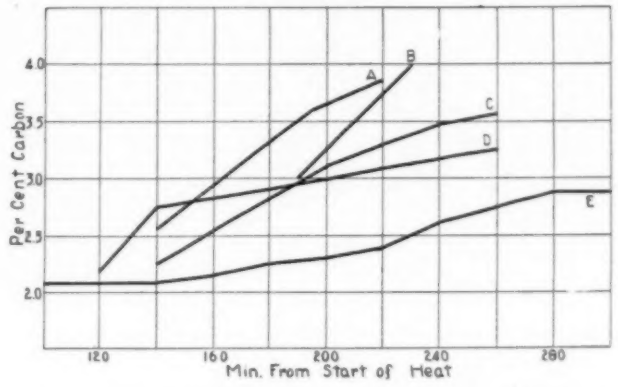


Fig. 48—Various recarburizers affect a heat of metal in different ways. The curves show the effect of: A, coal tar coke; B, flake graphite; C, 13 per cent ash coke; D, charcoal; E, 25 per cent ash coke

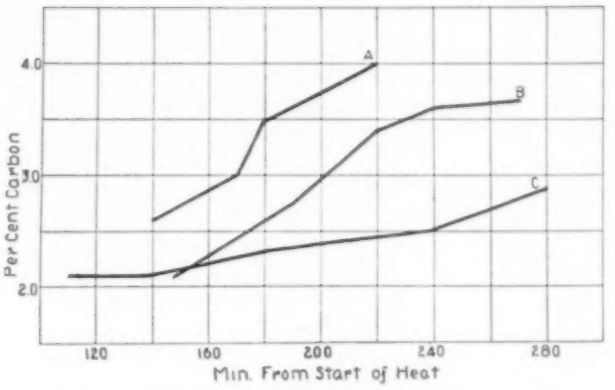


Fig. 49—The effect of ash in the recarburizers is to govern the speed of absorption, as is shown by: A, coal tar coke less than 4 per cent ash; B, low ash coke, ash content 12 per cent; C, coke, 25 per cent ash

aid in the rapid pick up of carbon.

An acid slag holds back the absorption more than does a basic carbide slag.

Silicon has no effect on the carbon absorption; manganese seems to aid this process; sulphur retards the pick up; phosphorus is negative in its action.

Figs. 48, 49, 50, 51, 52 and 53 show graphically the result of the above findings. These are taken from report of the work done at the Seattle station, bureau of mines, by Clyde E. Williams, and C. E. Sims.

While the majority of the experiments made on synthetic iron were made in open top furnaces with electric furnace pig iron in view, those of the author were made in standard arc furnaces, the metal being poured directly into iron castings. However, results are similar on the two processes, although the pit, or open-top furnace gives better carbon absorption. As the metal from such a furnace is not uniform its use in the foundry would not be practical unless accompanied by an auxiliary melting unit.

Any grade of steel scrap is suitable for synthetic iron, the cheaper in price the better with the one exception that such low grades of metal as baled tin cans, or burned iron will not be cheap at any price. The author worked for some length of time with the former and was unable to obtain satisfactory results under any conditions.

In starting a heat, charge on the hearth of the furnace the carburizing material calculated to 3.50 per cent carbon, the efficiency, determined by the material used, ranging from 50 per cent for common coke to 75 per cent for graphite, based upon the carbon content. The material should be of small mesh preferably under ⅛ inch in size. Under no conditions use any slag material. Now charge the metal and turn on the current, sealing the furnace as far as possible, as any air entering the furnace will result in a needless burning up of carbon. As soon as small pools of molten metal form under the electrodes, throw a small amount of the recarburizer in these holes. This will tend to steady the arc, and at the same time will furnish a spot of carbon directly where needed. This will increase the speed of melting as, during the heating of the metal to its melting point, it will absorb carbon slightly and aid by a lowering of its fusing point. Be sure that the doors are kept sealed at all times.

As soon as the bath is melted, open the doors and inspect the furnace. Any material on the walls may be pushed in and the surface of the metal may be inspected for any slag coming up from either the hearth or the scrap charged, usually consisting of the dirt and impurities held with the charged metal. If any slag

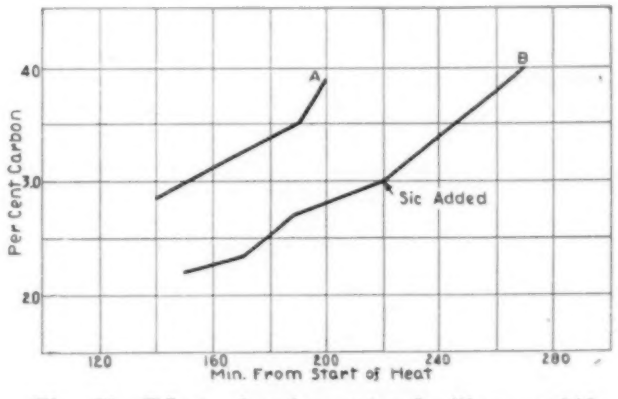


Fig. 50—Effect of using natural silicon carbide, carburundum, after the bath is melted is shown as follows: A, heat, run with coal tar coke, a highly efficient recarburizer; B, coke with 25 per cent ash used to point where carborundum sand was added

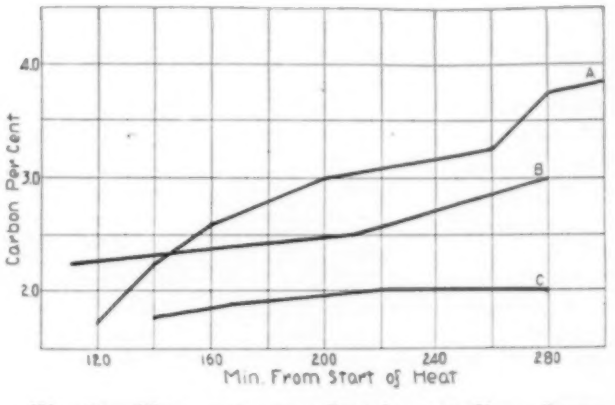


Fig. 51—Slags exert an effect in retarding absorption: A, high ash coke with carbide slag; B, high ash coke in presence of acid slag; C, high ash coke on bare metal, explained by elimination of coke carbon picked up by entering air from doors

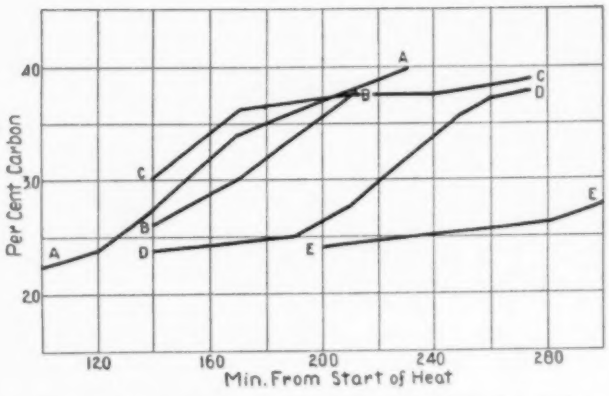


Fig. 52—Various elements affect carbon absorption, A, manganese content of metal, 1.75 per cent; B, silicon, 2 per cent, other alloys low; C, practically pure iron with silicon, 0.20 per cent, manganese, 0.40 per cent, sulphur and phosphorus, 0.05 per cent; D, phosphorus, 0.70 per cent; E. sulphur, 0.75 per cent

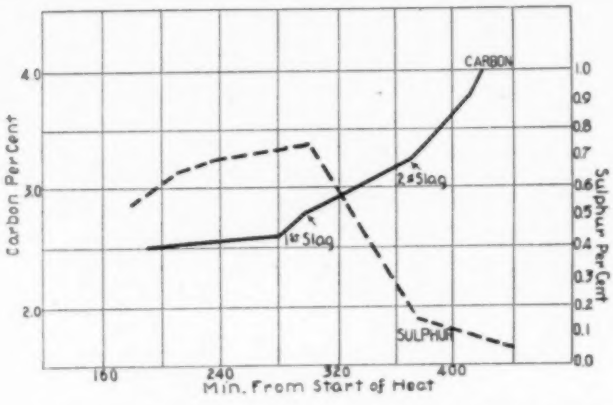


Fig. 53—The rate of carbon absorption is increased at a rapid rate as the percentage of sulphur is lowered, in this case by two carbide slags; A, percentage of carbon in the metal as heat advances; B, curve of sulphur content showing effect of slags

shows, it should be raked off carefully and sufficient of the recarburizer added adequately to cover the molten metal. Next, take a spoon test and pour into a sand mold on end, a bar about 1 inch square and 6 inches long being a satisfactory size. Leave this bar in the sand until it is black and then air cool or water quench. This test, on fracture usually will show blowy and will be clear white. The crytsals will appear rather fine, but the structure will be irregular and more or less feathered, the exact outline of the crystalline structure being indistinct.

Further Additions Unnecessary

If a chemist is at hand a sample may be sent for an analysis of the carbon, which in the vast majority of cases will show from 2.50 to 2.75 per cent. If there is plenty of the carbon on the metal, it will not be necessary to make any further additions, if not, enough must be added to cover the iron. It is important at all times to keep the bath of molten metal covered thoroughly with an excess supply of the recarburizer until the percentage of carbon is at the desired point.

If the metal is hot enough to run cleanly from the test spoon the next step may be taken; if not, the bath must be heated further. When a superheated temperature is attained, the bath may be boiled to raise the carbon.

Several shovels of graphite flakes or carborundum sand should be thrown in and green wood poles inserted through each door. These poles should be about two inches in diameter and as long as it is possible to obtain. They are inserted into the metal about a foot deep and moved from side to side, the current being turned off. A violent boiling will ensue, the recarburizer will be mixed throughout the bath, and the carbon will rise rapidly. Boiling in this manner for 15 minutes with two poles easily will raise the carbon content from 0.40 to 0.50 per cent. After the first boiling period of about 10 minutes, the current again is turned on and another metal test taken. This process should be repeated until two tests are obtained approximately of the same fracture appearance. This denotes that the molten metal is nearing equilibrium under the given conditions.

Such a metal, if the temperature is high, should contain from 3.25 to 3.50 per cent carbon. The test will show a *fiery* fracture of large size crystals radiating from the center. The metal will have a close knit appearance, and will show freedom from blowholes or flaws. The general color will be a deep white tending toward a grayish color, the crystals appearing clear cut and distinct. The ordinary lime slag now may be added, together with the alloys, and the final period begins.

May Judge by Fractures

As soon as the silicon enters the metal the appearance of the iron changes. It assumes the sluggish flow of ordinary gray iron, but has a bluish color, and a sparkling flow much different from the ordinary grades of cast iron, due probably to the low percentage of phosphorus and sulphur. The metal now may be judged by fracture and when the softness has reached a maximum the iron can be tapped.

Neutral Hearth Melting

EXPERIMENTS have been conducted on melting iron on a neutral hearth, the idea being that either acid or basic operation could be affected in the one furnace. Irons of low sulphur could be melted under acid conditions, while those with a higher percentage of this element could be refined under the ordinary lime slag. The lining materials used in making the neutral hearths were mainly two, chrome ore and rammed carbon.

The chrome ore offered such difficulty in obtaining a well sintered and lasting hearth that its use quickly was discarded. The carbon hearth gave better results, but they were not such as to promise any advantages over the ordinary methods of melting. While it was found that the metal did pick up a little carbon from the hearth it was insignificant, the greatest trouble being the rapid wearing away of the banks and jambs. This was pronounced, especially above the metal line, where any entering air directly impinged and combined with the carbon of the walls. A set of jambs would not wear any length of time and these operations quickly were discontinued.

For the shop making nothing but gray iron, the carbon hearth offers certain advantages, especially in the absolute freedom of any included gases coming from dissolved oxide, and with the higher quality of refractories which at present can be obtained, this process might be so developed as to give favorable results. The amount of time which the author spent on this process was limited and his results cannot be accepted in any manner as final or absolutely authoritative.

Controlling Characteristics

SYNTHETIC gray irons are peculiar in their actions. Two heats of practically the same analysis, made from the same scrap, and melted under exactly the same conditions will have widely differing qualities. One will be as soft and free cutting as any iron could be, while the next may be so hard that it can be drilled only with difficulty. Naturally, in the shop producing castings from this metal such conditions could not exist as there would be an endless amount of trouble from mixing the soft and hard irons.

This is the situation which first confronted the writer when experiments were being conducted on this metal. It was obvious that the differences occurring in irons of similar analyses only could be caused by differences in structure on cooling, and experiments were conducted along lines of different treatments to give a uniform softness to castings produced by this method. It was found that the hard irons quickly reacted to a simple heat treatment, the metal being soft on cooling.

The castings are charged into a cold or slightly warm furnace, heated by any of the ordinary methods, although the electric anneal is superior for regular results. Care must be exercised to support the pieces to prevent any tendency to warp and charging must be such that the entire charge is exposed directly to the heat. A small amount of some carbonaceous material is charged in the furnace to supply a heavy reducing atmosphere. If this is neglected the outer skin of the castings will be hard and offer considerable trouble when being machined. Heat the entire charge slowly to a distinct red color, the temperature at which maximum softness is obtained being close to 1400 degrees Fahr. Permit the castings to soak at this temperature until the heat is uniform throughout the various sections, when the furnace may be shut down, and the charge cooled slowly.

Strength of Metal Drops

Castings annealed by this method show a soft iron, but that there is a considerable drop in the strength of the metal when so treated. Consequently, iron intended to meet a certain strength requirement cannot be so handled. The usual test on a heat of synthetic iron is to cast a test bar 2 inches in diameter and about a foot long. When cold, after being allowed to stand in the mold until black, it is placed in a lathe and threads are cut in it. If it machines easily no further treatment is required on that heat.

While these experiments were being conducted, it also was found that this treating could be manipulated to obtain irons of different degrees of hardness from the same heat. This was done by regulating the speed of cooling. A casting heated to 1400 degrees Fahr. and slowly cooled would be extremely soft, while one pulled from the annealing furnace and air cooled would be an unusually hard gray, often verging on the white. Also, it was found that castings could be made with one face hard, and the back soft and strong, by the proper use of chills, mud, lime, etc. This led to favorable results as almost any kind of an iron could be poured from the same heat, merely by changing the treatment. Chilled irons could be made without the use of a chill. This would constitute a great saving, especially where only one or two pieces had to be made in a hurry, with no time to cast a chill. With the many helps for the heat treating department which have been lately developed there is no doubt but that results of a surprising nature may be obtained by variations of the processes mentioned.

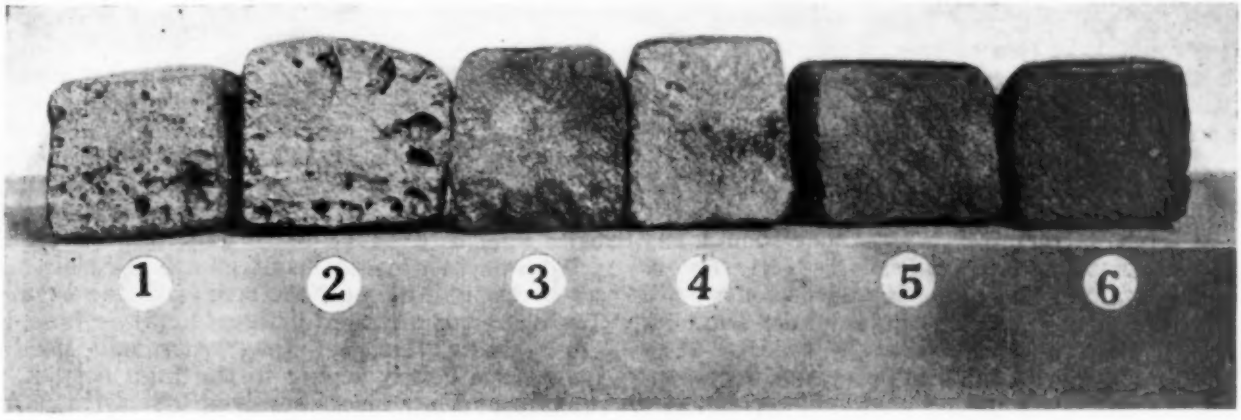


Fig. 54—Fractures of gray iron made from steel scrap. All test bars poured on end in a sand mold and allowed to cool until dead black, then water quenched and broken with a hammer.

No. 1

Test taken as soon as the bath of metal had melted. Note the blowy condition with feathery fracture. Carbon analyzed at this point about 2.60 per cent.

No. 2

Test taken after adding graphite flakes and vigorously boiling. Carbon analyzed about 3.00 per cent.

No. 3

Test taken after another boiling for 10 minutes with the addition of carborundum sand. Note the freedom of gas holes and the crystalline structure radiating from the center. Carbon about 3.30 per cent.

No. 4

Silicon added at 0.75 per cent. Fracture mottled. Note distinct crystalline structure on the corners of the test block showing satisfactory carbon.

No. 5

After further additions of silicon, and with the entire amount of manganese added. Metal now under a carbide slag. Note the close knit appearance of the iron.

No. 6

Final test taken immediately before the pour. Note the separation of graphite and the extreme softness of the fractured test bar.

The Shakeout

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FRANK G. STEINEBACH, Associate Editor

¶ Suiting the Buyer

WHAT would you think of a reputable business man, supposed to possess all his faculties and alleged to be sound in mind and body, who would attempt to buy a suit of clothes after the following fashion: He enters a tailor shop where men's wearing apparel of quality, made to order and guaranteed to fit is offered for sale. He asks the tailor if he can supply a plain gray tweed suit, coat vest and trousers of conservative cut, designed to stand the wear and tear of office service. On receiving an affirmative answer from the tailor, our inquiring business man blandly remarks, "I'll give you $34.10 for such a suit."

CAN you imagine the way in which the average tailor would receive such an offer? Picture also, if you can supply the vernacular of an indignant tailor, the words he would launch at anyone who would venture to suggest what *he* should charge for his product. Of course the would-be buyer might point out that the goods would cost only about $9 and that two tailors, working 12 hours at $1 an hour could cut and make the suit and that this would leave a margin of $3.10, or 10 per cent profit for the shop.

CAN you imagine anyone buying a suit, an automobile, or a new screen door strictly on the basis of such bartering? Why, then, should any manufacturer, any user of castings feel free to call on the foundry supplying his needs for a price based solely on the buyers limited knowledge of what such castings might cost. Perhaps, after all, the fault is partly with foundrymen, who continue to compete, cut prices and make ridiculous offers. Too many regard their products as only so much metal worth a moderate price per pound, but in no sense to be considered as finished articles of high quality, requiring skill and business acumen to make and sell.

Can't we learn the lesson that *castings is castings?*

¶ Appearing in Person

TEN years ago Americans were a race of athletes, by proxy. Exercise took the form of sitting comfortably in grandstand seats armed with bottles of pop and bags of fresh roasted. The only exertion was that required to hurl advice at two opposing teams of professional ball players. Or perhaps athletic pursuits took another turn and the strong men of the day flocked about the padded rope-fenced square, erroneously called a ring, where they begged two pummeling, bruising fighting men to exert yet greater effort in behalf of the great mass who thus took their exercise. Perhaps when displeased they sarcastically begged the original pair to dance a waltz together.

Today the crowded condition of sandlot baseball fields, the prevalence of interplant and club ball teams, the increase of public golf links and the full use of golf club privileges on all possible occasions testify to the growing interest in athletics—in the first person.

SIMILARLY, only short time ago large technical and business organizations were operated by and for small groups of forceful men. Today, the work is so divided that committees carry on important work and each member of each committee is given full opportunity to participate in organization activities. This has brought greater accomplishment and also has caused the growth and spread of useful engineering, commercial and industrial societies into much wider fields.

¶ Seeking New Pastures

IN TRAVELING through New England one cannot help but notice the large number of farms which had been abandoned due to the worked out condition of the land. The owners of these farms did not go out of business and quit farming in disgust, but they sought new pastures where they were able to produce more with less effort.

Foundrymen could profit greatly by doing likewise—by getting out of the *rut*. One man did. The owner of a large jobbing foundry whose business during the past few years had been far from satisfactory owing to the high cost of production and low prices received for castings, made an effort to find out just what was wrong. After going over the ground carefully he came to realize that prevailing conditions made of the jobbing foundry business a poor and lean farm.

THE foundryman came to the full realization that if he wished to survive and make a success of his business he would have to become independent. He attained this by abandoning the old farm and seeking new pastures. He developed a staple article in its entirety where the great number of component parts are iron castings that can be produced satisfactorily in his own foundry. This places him in a position to accept or reject any jobbing work. This part of his business has become a side line to his regular line of work. If foundrymen would seek a complete staple article or use their ingenuity they might produce something the public wants with benefit to themselves.

Trade Outlook in the Foundry Industry

FREDERICK B. STEVENS in a signed article in a Detroit paper gives a true picture of conditions which influence business today. He says, "At the time of the last national campaign we were led on to a high mountain, where we saw brilliant prospects; where we saw immediate increased prosperity. That was good advertising from a psychological standpoint, because it gave us a new hope, it created new courage and it stimulated us to better endeavor. That imaginary and much heralded prosperity has not developed and therein we are disappointed, because things are not as advertised."

Expect Too Much

That this factor is not entirely to blame is further stated, but its truth still is undisputed. Many foundries which feel that business is not as good as it should be, would be surprised to compare not only the production figures, but the profits obtaining at present with those over a period of five years or more preceding 1925. At present many foundries are operating at 75 per cent of capacity and still feel that this is much below normal. However, in many cases these same shops have more than doubled their facilities during the past five years and still refuse to accept the present rate as satisfactory. Conditions are spotty. One malleable foundry, for example, may be practically at a standstill, while another within a few hundred miles is working full time. During April, improvement was noted in malleable operations, according to statistics compiled by the department of commerce. The total of orders booked increased to 55.4 per cent of capacity, compared with 53.6 per cent for March and 53.4 per cent for February. These computations are based on reports from 130 identical plants. Of 143 plants having a combined capacity of 114,195 tons per month the same general condition is true.

Prices for Raw Materials for Foundry Use

CORRECTED TO JUNE 6

Iron		Scrap	
No. 2 foundry, Valley	$18.50 to 19.00	Heavy melting steel, Valley	$17.50 to 18.00
No. 2 southern, Birmingham	18.00 to 21.00	Heavy melting steel, Pitts.	17.00 to 17.50
No. 2 foundry, Chicago	20.50 to 21.00	Heavy melting steel, Chicago	16.00 to 16.50
No. 2 foundry, Philadelphia	21.26 to 21.76	Stove plate, Chicago	15.75 to 16.25
No. 2 foundry, Buffalo	19.00	No. 1 cast, Chicago	20.25 to 20.75
Basic, Valley	18.50	No. 1 cast, Philadelphia	17.50 to 18.00
Basic, Buffalo	19.00	No. 1 cast, Birmingham	16.50 to 17.00
Malleable, Chicago	20.50 to 21.00	No. 1 cast, Buffalo	15.50 to 16.00
Malleable Buffalo	19.00 to 19.50	Car wheels, iron, Pittsburgh	16.00 to 16.50
Coke		Car wheels, iron, Chicago	17.00 to 17.50
Connellsville foundry, coke	$3.75 to 4.25	Railroad malleable, Chicago	18.50 to 19.00
Wise County foundry, coke	4.50 to 5.25	Agricultural, mal., Chicago	17.00 to 17.50
		Malleable, Buffalo	17.50 to 18.00

Auto Shops Pass Peak

Many makers of automobiles hold the opinion that the peak of production has been passed for 1925, with May perhaps marking the record. During April, according to the department of commerce, the total output of passenger automobiles and trucks for the United States and Canada was 438,965, compared with 377,218 for the previous month. These totals are from reports of 182 different firms, 73 making passenger cars, 127 building trucks and 18 of these making both classes of vehicles. Foundries making automotive castings continue busy throughout the central west. The demand was heaviest during April, surpassing in many instances all previous records for casting orders from automobile builders. Gray iron, steel and malleable foundries all have been benefited. Steel castings production dropped slightly during April, but improved conditions are reported for the close of May. The total bookings of steel castings in April stood at 63.9 per cent of capacity, according to the department of commerce. This was only 2 per cent behind the orders received in March. Orders for railway specialties increased slightly.

Railway Buying Slow

Railway purchases have dropped behind during the past few weeks, although freight loadings have increased to new high totals. The week of May 23 showed 986,209 cars loaded. This was the peak for the current year and is much higher than the same week last year. However, the rapidity and efficiency with which freight is handled still maintains a comfortable surplus of cars. Large users of iron are buying in quantity. The total of sales during May is said to have exceeded 700,000 tons. Some purchases for third quarter shipment, notably from radiator and sanitary ware shops are reported. Production of pig iron continued its downward swing in May, according to the *Iron Trade Review*. The total production of all classes of pig iron was 2,929,540 gross tons, compared with 3,211,235 tons in April, a decrease of 8.7 per cent. Daily average production figures show the May rate was 94,501 tons and that obtaining in April 107,041 tons, giving a decline of 11.7 per cent. The total of merchant iron produced in May was 607,053 tons, giving a loss of 82,109 tons compared with the preceding month. April's daily average rate was 22,972 tons and this declined to 19,582 tons of merchant iron made per day in May. During May one merchant stack was blown in and 10 were blown out.

Nonferrous Operations

Brass and aluminum foundries making automotive work are busy. Plumbing goods shops are not so active, but look for increased business in the near future. Nonferrous prices based on New York quotations in the *Daily Metal Trade* of June 6, follow: Casting copper, 13.05c; electrolytic copper, 13.62½c; Straits tin, 56.37½c; lead, 8.75c; antimony, 16.75c; nickel, 38.00c; No. 12 aluminum, remelt, 22.50c. Zinc is 7.05c to 7.10c, E. St. Louis, Ill. Average monthly prices for May follow:

New York Prices

Castings Copper	Electrolytic Copper	Lead	Tin Straits	Antimony	Aluminum 98-99	Zinc St. Louis
13.103	13.610	8.145	54.642	16.428	27.00	6.958

Comings and Goings of Foundrymen

WILLIAM K. Frank, elected president of the Pittsburgh Foundrymen's association at its meeting held at the General Forbes hotel, Pittsburgh, May 18, and who will take office at the June gathering, is vice president, director and general manager of the Damascus Bronze Co., Pittsburgh. After being graduated from Cornell university in 1911, Mr. Frank became affiliated with the Damascus company as chemist. He has advanced rapidly through the various departments to his present position. He is a son of I. W. Frank, chairman of the United Engineering & Foundry Co., who was one of the founders of the Pittsburgh Foundrymen's association and one of its early presidents.

Frank D. Chase, president of Frank D. Chase, Inc., Chicago, has been elected trustee for three years of the Western Society of Engineers, Chicago.

Clarence R. Falk, secretary and treasurer of the Falk Corp., Milwaukee, has returned from a five months' tour of Europe, embracing a visit to Egypt and the Holy Land.

H. Foster Bain has resigned as director of the bureau of mines to become chief secretary of the American Institute of Mining and Metallurgical Engineers. Mr. Bain has been director of the bureau since 1921.

A. A. Corbeille, formerly general manager of the Huron Gray Iron Foundry Co., Ypsilanti, Mich., has taken over that plant as proprietor and will continue to manufacture general jobbing and machine castings.

Fred Erb, foundry manager of the Packard Motor Car Co., Detroit, addressed the June meeting of the New England Foundrymen's association on Wednesday June 10 on "Production and Inventory Control in an Automobile Foundry."

Albert W. Bennett has been appointed superintendent of the Thomas Hinds Foundry & Machine Co., Malone, N. Y. Mr. Bennett formerly was foreman of the Monitor Furnace Co., Cincinnati, O., and superintendent of the Keystone Foundry Co., Plymouth, Ind.

Clarence D. Stewart, Amsterdam, N. Y., has been appointed receiver for the Troy Foundry & Machine Co. Inc., Troy, N. Y. This company formerly was known as the Troy Foundry & Machinery Co., and was reorganized last August, with E. D. Hodgkins of Port Henry as president.

Frank Chaplau, for the past 25 years foundry superintendent of the Gilson Mfg. Co., Port Washington, Wis., has been made president of the recently organized Quality Brass Co. of that city. Christ Mickles, formerly in charge of the core room of the Gilson company is vice president of the new company.

Vincent Delport, European manager, THE FOUNDRY, 2 Caxton House, Westminster, London, England, has been made a special representative of the American Foundrymen's association committee on international relations. He will act as a contact man in Europe to assist visitors to the International Foundry congress to be held in Detroit in 1926.

WILLIAM K. FRANK

C. A. Parliament has resigned as purchasing agent for the Chicago Hardware Foundry Co., North Chicago, Ill., with which firm he has been connected for the past 11 years, to become vice president of the Williams Alloy Products Co., Chicago. Mr. Parliament will be located at the Elyria plant of the Williams company where bronze alloy piston rings, aluminum pistons, bearings and bushings are made.

James Murrie recently resigned as superintendent of the West Newton, Pa. plant of the U. S. Radiator Corp. which position he has held for the past 15 years. His total length of service with the corporation was 27 years. Mr. Murrie has been made superintendent of the Columbiana Foundry Co., McKeesport, Pa. The latter company manufacturers radiators, boilers, builders specialties and gray iron castings.

J. W. Bolton, metallurgist, the Niles Tool Works Co., Hamilton, O., was awarded the advance degree of master of science at Rose Polytechnic institute, Terre Haute, Ind., June 11. Mr. Bolton who was graduated from that institute in 1918 is known for his work along metallurgical lines and for his contributions to the literature of metallurgy and metallography. He is first vice president of the Cincinnati chapter of the American Chemical society.

B. D. Quarrie has been elected vice president of the Paper & Textile Machinery Co. of Sandusky. This company manufactures paper and textile machinery, suction pumps, etc., and in addition controls valuable patents covering the centrifugal casting of ferrous and non-ferrous metals. Mr. Quarrie was formerly general manager for the Otis Steel Co., and before that he was general superintendent for the Newburg mills of the American Steel & Wire Co. at Cleveland. W. H. Millspaugh is president of the Paper & Textile Machinery Co.

Emile Ramas who has been president of the French Foundrymen's association for the past six years has been re-elected to this office for the seventh year. It will be recalled that Mr. Ramas visited the United States on the occasion of the convention in Cleveland, in April, 1923, when he made many friends among American foundrymen. G. H. Clamer, who was then president of the American Foundrymen's association, returned the visit in the same year when a delegation of American foundrymen visited Europe in connection with the International congress held in Paris in September, 1923.

The recent sale of the Lumen Bearing Co., Youngstown, O., to the Falcon Bronze Co. of that city does not change the status of the Lumen Bearing Co., Buffalo, as the latter is a separate corporation.

Sproul Heads American Refractory Institute

William C. Sproul, former governor of Pennsylvania, recently was elected president of the American Refractories institute. This is a new organization formed to promote the interests of the manufacturers and consumers of refractory materials. Refractories, or heat-resisting materials, are of vital importance in many key industries. Raw materials such as fireclay, silica rock, magnesite chromite and diaspor, are used in their manufacture, the state of Pennsylvania being the largest producer, although manufacturing plants are located in 24 states. The annual production of all types of refractories has a value of approximately $75,000,000, those made of fireclay representing about 75 per cent.

WILLIAM C. SPROUL

Such industries as those producing iron, steel and many other metals, cement, steam and electrical power, etc. are dependent upon refractory products for the economical operation of their plants, as refractories form the linings for their furnaces and cannot be replaced satisfactory with any other type of material. There is a growing need for heat-resisting materials that will withstand more severe usage than the modern products will bear, and it is planned to meet this industrial requirement through developments arising from research work carried on by the institute.

Laboratories and a corps of technical specialists are to be maintained at Mellon Institute of Industrial Research, University of Pittsburgh, for conducting tests on raw materials and finished products and to make investigations dealing with the problems of consumers as well as of manufacturers. For the first year this work is being largely sustained by the manufacturers of refractories, but it is planned to interest the users sufficiently that they also will participate in the support of the project.

Marking Patterns Keeps Records Straight

(*Concluded from Page* 492)

surface is carved as required. The letters then are attached to the block and the plate made. This method is much more satisfactory than bending the castings to suit. A letter also is on the market made of sheet brass which may be nailed to wood patterns.

Sometimes it is necessary to make the nameplate on the side of the pattern instead of on the cope or drag. In this case a loose print may be fastened with nails or screws from the inside of the pattern in such a way that the print may be loosened before drawing the pattern. After the pattern is drawn, the print is drawn back and a core is placed in the print impression. This core has the impression of the name plate on it.

The supply of letters and figures of different size and style should be kept in separate compartments to avoid a chance of mixing.

Patterns should be filed or scraped clean where letters are to be placed when sweating brass letters on iron patterns. A copper solution consisting of 4 ounces of water, 1 ounce of powdered sulphate of copper and 1 drachm of nitric acid is applied and a copper coating formed. This coating tins smoothly, using strong muriatic acid, and cut with zinc. The backs of the letters then are cleaned. Acid is put on the tinned surface and the letters laid on as desired. A hot soldering iron or blow torch then may be applied to the letter until the tinned surfaces melt and run together.

Tornado Damage Slight

The foundry of the Osborn Mfg. Co., at Grafton, O., recently suffered a nominal loss from a tornado, the damage being confined chiefly to the patternshop and pattern storage. The plant was shut down three days to make necessary repairs.

John J. Murphy has been made district sales manager by the Industrial Works, Bay City, Mich., of the new Atlanta, Ga. district with offices at 843-A Hurt Bldg., Atlanta, Ga.

J. E. Fletcher To Deliver Exchange Paper

J. E. Fletcher, consultant of the British Cast Iron Research association, will present the annual Institute of British Foundrymen exchange paper before the Syracuse meeting of the American Foundrymen's association, Oct. 5-9. Mr. Fletcher, who will present the paper in person, will speak on "Some Inter-relationships in Cast Iron, Wrought Iron and Steel Practice." He is one of the foremost British authorities and the American association is honored to have the distinguished guest at its meeting.

Mr. Fletcher has had a lifelong connection with the foundry industry. He was trained in Sheffield at Central school and Firth college, and also at the Royal College of Science and School of Mines. He was apprenticed with the Savile Street Foundry & Engineering Co., Sheffield, where he worked as a molder and later was given charge of the steel and iron foundries. His further association with the Clay Cross Co. brought him in touch with the iron and steel works plant. Later he joined the works staff of Thomas First & Son, Ltd., Sheffield and was appointed steel foundry manager of the Norfolk works. Later he became foundry manager in the works of Cammell Laird & Co., Ltd., having charge of the iron and steel foundries.

J. E. FLETCHER

While associated with the late Frederick Stubbs, then general manager of Cammell's works at Grimesthorpe, he had considerable experience in ferrous alloys research, especially in con-

nection with chilled castings in iron and steel. He spent some time in Germany and France during the development of the Harmet fluid compression of steel and of the Krupp armor treatment process. He later became connected with the Hall's Patent Anchor Co., and had an active interest in the development of cast steel anchors.

Since 1905 Mr. Fletcher has been associated with the iron and steel industry in Black county as consulting engineer and metallurgical adviser to Messrs. N. Hingley & Sons., Ltd., of the Netherton Ironworks, Dudley.

Elect Branch Officers

The annual general meeting of the London branch of the Institute of British Foundrymen was held May 2 at Luton, Bedfordshire. At the preceding branch council meeting the following nominations were made: President, George C. Pierce, senior vice president and honorary treasurer, R. J Shaw; junior vice president, W. B. Lake; honorary secretary, H. G. Sommerfield. J. W. Gardon succeeded H. Cole Estep on the council. The Skefko Ball Bearing Co., Ltd. and the Davis Gas Stove Co., Ltd. were visited. The latter concern operates one of the largest foundries in the south of England.

Discuss Malleable Iron

The May meeting of the Quad-City Foundrymen's association, held at the Davenport, Ia., chamber of commerce, May 25, was devoted entirely to the subject of malleable iron. The chemistry of malleable iron was discussed by R. Hinde, Tri-City Malleable Castings Co., East Moline, Ill., while the melting and annealing of malleable castings was discussed by C. Howard Ross, Union Malleable Iron Co., East Moline. Models of annealing and melting furnaces were exhibited and an interesting discussion developed. Joseph B. Deisher, American Malleable Castings association, was present and took part in the discussion. The following officers were elected for the coming year: President, P. T. Bancroft, John Deere Harvester Works, East Moline; vice president, J. H. Diedrich, Blackhawk Foundry & Machine Co., Davenport; secretary and treasurer, D. H. Ward, Union Malleable Iron Co., East Moline; directors, A. K. Reading, Zimmerman Steel Co., Davenport; John H. Ploehn, French & Hecht, Davenport; Roy Schoefer, Rock Island Plow Co., Rock Island; A. E. Hageboeck, Frank Foundries Corp., Moline, and C. Howard Ross, Union Malleable Iron Co.

Opens Branch Office

The Sullivan Machinery Co., Chicago, has opened a new branch office at 208 W. Market street, Pottsville, Pa., in conjunction with the Pottsville Supply Co. Inc., which has been local agent for Sullivan equipment for several years past. A. K. Owen will continue in charge under direction of Edward W. Noyes, district manager at Scranton, Pa.

Recommend Microscope as Control Instrument

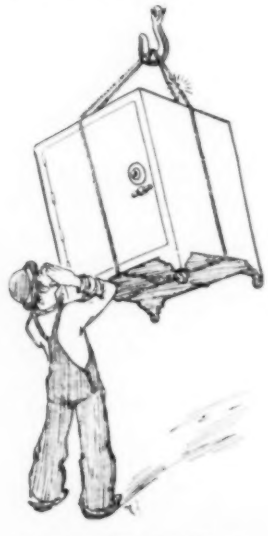
(*Concluded from Page* 489)

24 millimeter objective and 7½x eyepiece with a bellows extension of 43½ centimeter.

It has been found that the microscope is a valuable control instrument in annealing steel castings. When the microstructure is satisfactory the physical tensile tests will more than meet the specification. Coupon test bars cast on a casting of heavier section than the test bar are not representative of either the microstructure or the physical tensile properties of the casting. The true dendritic structure and the nonmetallic inclusions in steel castings do not appear to be altered or moved by any commercial heat treatment. Castings of light section can be satisfactorily treated by a simple anneal to just above the critical temperature. Castings of heavy section and mass appear to require a more complicated heat treatment to commercially eliminate casting structure, give satisfactory microstructure, and get maximum ductility.

Spheroidization of the lamellar cementite of the pearlitic constituent greatly increases the ductility of the material.

Faked Foundry Facts



I et 'er Down Easy

Obituary

E. L. Cleaveland, former president of the Garden City Foundry Co., Chicago, died at his home in Hinsdale, Ill., a suburb of Chicago, May 28.

Charles F. Drozeski, president of the Central Malleable Castings Co., Franklin Park, Chicago, died at the Evanston hospital, May 26 at the age of 63 years. Mr. Drozeski formerly was general manager of the Saginaw Malleable Iron Co., Saginaw, Mich., leaving several years ago to found the Central company in Chicago. His son, Donald, is active in the management of the Central Malleable Castings Co.

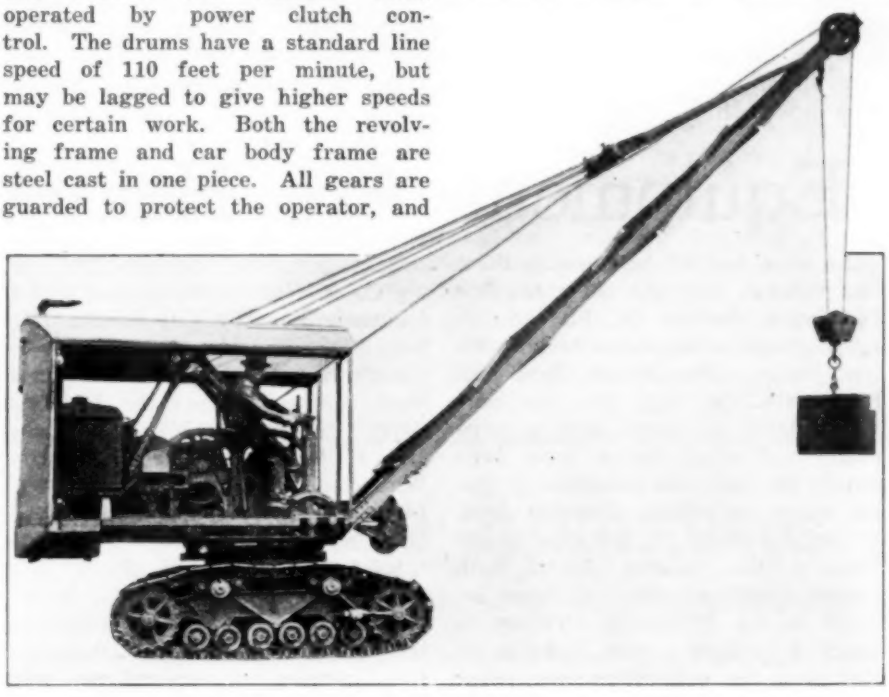
Foundry Instructors To Meet at Syracuse

A special invitation is being extended by the American Foundrymen's association to all technical school and foundry instructors to meet at Syracuse, N. Y., at the time of the annual American Foundrymen's association convention. An informal gathering is being planned by the committee under the direction of Prof. A. E. Wells, head of the shop laboratories Cornell university, assisted by John Grennan, University of Michigan, and William Dosey, Carnegie Institute of Technology. Two or three prominent foundrymen are being secured to address a dinner gathering of the group who may accept the hospitality of the American Foundrymen's association. After the talks, the meeting will be devoted to getting acquainted. The foundry, exhibits and technical sessions will be open to all instructors attending.

The Watson Engineering Co., New York, consulting engineer, specializing in foundry work, has moved from 15 Park Row to larger quarters at 140 Cedar street.

Excavator Is Driven by Gasoline Engine

The line of excavators manufactured by the Harnischfeger Corp., Milwaukee, Wis., has been enlarged by the development of a ½-yard full revolving gasoline or electric machine mounted on corduroy traction. Power is supplied by a gasoline motor of the heavy duty tractor type, developing 40 horsepower at 960 revolutions per minute. All power is transmitted through cut steel gears. The two main drums are mounted independently on separate shafts and are controlled by outside band clutches and brakes, the clutches being operated by power clutch control. The drums have a standard line speed of 110 feet per minute, but may be lagged to give higher speeds for certain work. Both the revolving frame and car body frame are steel cast in one piece. All gears are guarded to protect the operator, and the first reduction and travel gears are fully enclosed, running in oil. Two travel speeds forward and reverse are provided, namely 11/16 and 1⅜ miles per hour. Steering is controlled from the operators platform by a hand wheel.



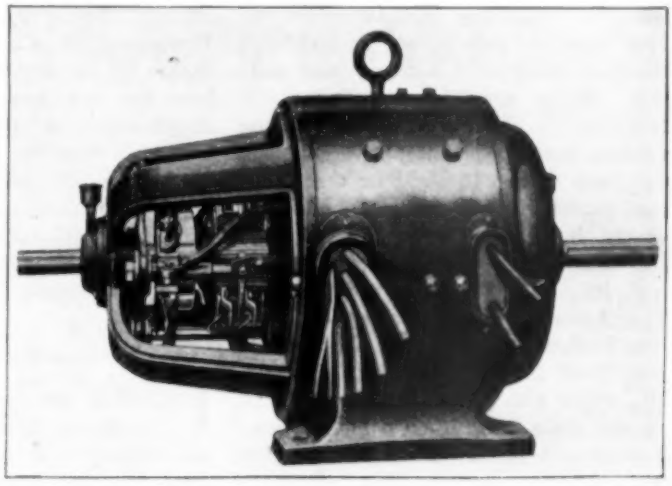
THE MACHINE HANDLES A ½-YARD DRAGLINE OR CLAMSHELL BUCKET

The machine handles a ½-yard dragline or clamshell bucket on a 30-foot boom and has a rated lifting capacity of 13,000 pounds at 10-foot radius. The new machine is shown in the accompanying illustration.

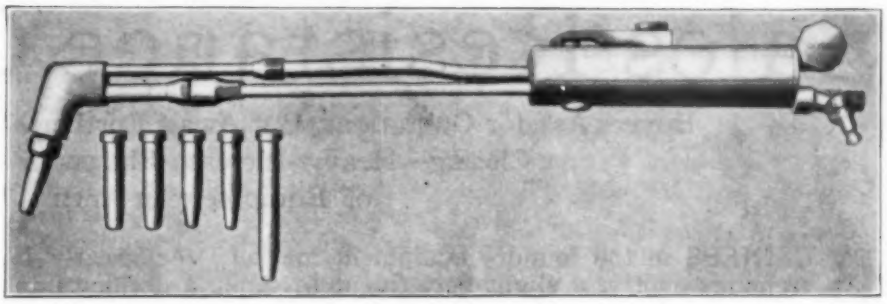
Welding Generator May Be Short Circuited

The Electric Arc Cutting & Welding Co., Newark, N. J., has developed a new welding generator which gives either direct or alternating current. The generator is ball bearing 225 amperes capacity, compound and interpole fields, self regulating, but is not separately excited. The field windings are wound on steel bobbins and baked solid in enamel before mounting rigidly on the poles. The poles are rigidly mounted on the frame. The armature is one complete baked unit with direct current commutator and alternating current collector rings.

The feature claimed for the generator is that either direct current or alternating current leads may be short circuited at the collector rings or the commutator without injury. The generator voltage dies to a value that holds the current constant, no injury being done to the generator while in this condition. The generator is ball bearing, has a power take off at both ends for drive, for air compressor or anything to be driven. The generator may be driven direct, by belt, chain, with an electric motor, gas engine or steam engine.



THE GENERATOR PROVIDES DIRECT OR ALTERNATING CURRENT



LOW PRESSURE MAY BE USED FOR CUTTING AND WELDING

Builds Combination Torch

A low pressure torch especially constructed to operate with low pressure acetylene gas, city gas or hydrogen, but designed to use either low or high pressure gas, recently has been introduced by the Alexander Milburn Co., Baltimore. The standardized parts of cutting and welding torches manufactured by that company are utilized in this torch. The torch is adapted to perform welding as well as cutting work by the interchange of tips. The torch is of bronze forgings and special seamless tubing. The tips are copper and are interchangeable.

The Northwest Stove Works, Inc., Portland, Oreg., has moved into its new plant at Twenty-fourth and Gladstone streets. The company will continue to manufacture stoves, furnaces and will also do light jobbing work. J. B. Stokes will continue as manager.

Sement-Solvay Co. has removed its Detroit sales office from the Real Estate Exchange building to 2532 Buhl building in that city.

Sales Resistance Continues

Buyers Ask for Quotations, But Await Further Developments Before Closing—Heavy Increase Shown in Exports of Equipment in April

BUSINESS in the foundry equipment market remains spotty, a slight betterment in conditions being noted in the New England and Cleveland territories, while a falling off in sales is reported in the New York district. During the first five months of this year, many manufacturers of equipment have closed sufficient business to equal or exceed that realized during the similar period a year ago. In some lines, the volume of sales in May was slightly heavier than in April. Inquiries continue to be brought out at a good rate, with the same hesitancy in closing continuing as was noted during the past few months. There does not seem to be a possibility for greatly increased sales in this market until a decided improvement is experienced in foundry operations. Supplies are moving slowly and in small lots, since buyers find it possible to obtain quick deliveries.

Exports of foundry and molding equipment showed a heavy increase in April, the value of exports being $95,705 as compared with $49,951 in March. An exceptionally large increase was shown over the corresponding month in 1924 when the value was $11,813. The exports for ten months ended April was $536,166 as compared with $248,282 during the corresponding period last year.

Inquiries for Equipment Are Heavy

INQUIRIES for foundry equipment are slow in developing, according to representative selling interests in the Pittsburgh area. A fair degree of selling activity has been noted so far in June, but numerous projects are held over and action on equipment purchased is delayed. Included is the Patterson Foundry Co., East Liverpool, which again is laid on the shelf, and the Iron City Sanitary Mfg. Co., Zelienople, Pa., which will not close for a week or two. The sale of riddles, vibrators, flasks, etc., continues intermittently, foundries buying these and other supplies as needed since deliveries may be had whenever wanted. The Pittsburgh Lamp Brass & Glass Co., Pittsburgh, is in the market for a small cupola. It develops that the recent molding machine inquiry put out by the Westinghouse Electric & Mfg. Co. was for the purpose of obtaining market prices to base selling prices on second-hand molding machines it contemplated selling. While the Herman Pneumatic Machine Co., Zelienople, Pa., has numerous projects pending involving the purchase of one to eight or ten molding machines at a time, sales recently have been few. Included is the Reading Steel Casting Co., Reading, Pa., one large rollover machine. The American Woodworking Machine Co., Rochester, N. Y., purchased a cupola from the Whiting Corp., Harvey, Ill., which also sold one of its cupolas to the Gale Mfg. Co., Albion, Mich., and one to the J. I. Case Threshing Machine Co., Racine, Wis. Two of its 7500-pound helical worm geared ladles were sold to the Burnside Steel Co., Chicago and the Florence Pipe Foundry & Machine Co., Florence, N. J., purchased a large number of this type ladles. The Joseph Reid Gas Engine Co., Oil City, Pa., also purchased ladle equipment and a large number of small ladles have been bought by numerous foundries in this and other territories. Greenley Bros. & Co., Rockford, Ill., and the Sparts Foundry Co., Sparta, Mich., both bought tumbling mills. A large interest in the Pittsburgh territory is about to purchase a core shakeout installation, the proposition now being in its engineering department. The Pittsburgh Plate Glass Co., Creighton, Pa., has secured a shakeout bail, while the Ajax Iron Works, Corry, Pa., and and the American Steel Foundries, Chester, Pa., have purchased vibrator and shakeout equipment from the Stoney Foundry Engineering and Equipment Co., Cleveland. Crane purchases by foundry interests of late have been few and far between. The United Engineering & Foundry Co., Pittsburgh, decided to utilize a crane from its Canton, O., roll foundry and will not buy the one recently inquired for. The International Motor Co., Allentown, Pa., has bought a 5-ton 76-foot span crane from the Whiting Corp.

Chicago Buyers Hesitate

INQUIRY for foundry equipment in the Chicago district continues good, but difficulty is encountered in closing. The Berry Iron & Steel Co., St. Louis, has purchased sand mixing machinery from the National Engineering Co., Chicago. The Benton Harbor Malleable Foundry Co., Benton Harbor, Mich., and the Chevrolet Motor Co., Flint, Mich., have closed on sandblast equipment from the Pangborn Corp., Hagerstown, Md. The Lakeside Malleable Castings Co., Racine, Wis., and the Lavelle Foundry Co., Indianapolis, have purchased sandblast mills of the positive pressure tilted type from the W. W. Sly Mfg. Co., Cleveland. Deere & Co., Moline, Ill., has purchased tumbling mills from the Sly company. The S. Obermayer Co., Chicago, has received the order for equipment and supplies for the Quality Brass Co., Milwaukee, Wis., which recently was organized. The Nash Motor Co., Kenosha, Wis., has purchased a core knockout machine from the Stoney Foundry Engineering & Equipment Co., Cleveland.

Eastern Demand Falls

FOUNDRY equipment demand has shown a further decrease in the New York metropolitan district. Not in some time have remarks of pessimism been more frequent. The slackening may be attributed to the fact that foundry operations are slower. Of particular significance is the lack of demand for supplies. Sellers of sand assert that requests for the holding up of shipments are frequent, plant sidings being congested with other consignments. In other lines, such as core compounds, etc., sellers are having considerable difficulty in getting consumers to specify against contracts entered into earlier

in the year. Among the few substantial buyers of late is the Florence Pipe, Foundry & Machine Co., Florence, N. J., previously noted as planning the construction of a new addition. Further equipment is yet to be bought. New York dealers recently have sold some equipment to French and German foundry interests. It is said, purchasers included representatives from the German General Electric company. The Boynton Furnace Co., Jersey City, N. J., has closed on a sand machine from the Royer Foundry & Machine Co., Inc., Wilkes-Barre, Pa. The Elmira Foundry Co., Elmira, N. Y., has purchased two turntable cabinet type sand-blasting machines and dust arrester equipment from the W. W. Sly Mfg. Co., Cleveland. The Fagan Iron Works, Jersey City, N. J., and Frazer & Jones Co., Syracuse, N. Y., have purchased sand mixers from the National Engineering Co., Chicago. The Central Foundry Co., New York, and R. Hoe & Co., Dunellen, N. J., have purchased sand-blast equipment from the Pangborn Corp., Hagerstown, Md., as has the Hudson River Foundry Co., Poughkeepsie, N. Y. The International Heater Co., Utica, N. Y., has purchased vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland. A prospective buyer is the Samuel J. Cresswell Iron Works, Twenty-third and Cherry streets, Philadelphia, which recently awarded a contract for a foundry building. The Traylor Engineering Co., Allentown, Pa., is expected to be a buyer of pattern shop equipment, as a result of a fire which caused $75,000 damage.

Cleveland Inquiries Continue

THE volume of sales of foundry equipment in the Cleveland territory increased slightly during the last two weeks in May. A majority of manufacturers report that business in May was slightly better than in April. However, the first part of June brought a slackening, due it is thought to weather conditions. Inquiries continue at a good rate, but only a small percentage are developing into orders. Business in repairs and spare parts continues good. The Economy Fixture & Foundry Co., Cleveland, has secured a 300-pound melting furnace from the F. A. Coleman Co., Cleveland. Hull Iron & Steel Foundries, Ltd., Hull, Canada, has purchased sand-blast equipment from the Pangborn Corp., Hagerstown, Md., as has the General Motor Truck Co., Detroit. The Cadillac Motor Car Co., Detroit, the Griffin Wheel Co., Detroit, and the Ohio Steel Foundry Co., Lima, O., have purchased vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland.

New England Buying Heavier

NEW ENGLAND foundries are buying equipment and supplies more readily. Many melters, who have been waiting for more definite assurance on business conditions for the last half of the year, now are coming into the market. Inquiry for major equipment has improved. However, this inquiry is slow to materialize into orders. The Lovewell-Henrici Co., Chelsea, Mass., has purchased a 49-inch cupola. A number of Massachusetts foundries have placed orders for a total of approximately 20 cupolas. The Plainville Casting Co., Plainville, Conn., has bought sand-blast equipment from the Pangborn Corp., Hagerstown, Md. The Walworth Mfg. Co., Boston, and the Old Colony Foundry Co., Bridgewater, Mass., have purchased tumbling mills from the W. W. Sly Mfg. Co., Cleveland.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Landis Machine Co., Waynesboro, Pa., is letting contracts for an addition to its plant.

Hammond Brass Works, Hammond, Ind., suffered a loss estimated at $180,000 May 30 by fire.

Buckeye Traction Ditcher Co., Findlay, O. is taking bids on a brick and steel plant 100 x 173 feet, one story.

Marion Machine Foundry & Supply Co., Marion, Ind., has increased its capital stock from $375,000 to $1,500,000.

Littiston Harvester Co., Albany, Ga., will rebuild the portion of its place recently destroyed by fire.

General Die Casting Co., Stock Exchange building, Philadelphia, recently organized, has started the construction of a plant.

Central Brass Works, 501 Perry street, Reading, Pa., has been incorporated with $40,000 capital. W. H. Hinkel as treasurer.

Eastern Foundry Co., Boyertown, Pa., will make additions and has increased its capital from $300,000 to $400,000 to cover cost.

Schilling-Everts Co., 1822 Ellis street, Bellingham, Wash., will build a 1-story foundry and iron works.

Ford Motor Co., Detroit, is planning the installation of a new foundry and machine shop at Iron Mountain, Mich.

Pacific Brass & Hardware Mfg. Co. 1646 North Spring street, Los Angeles, will build a 1-story addition 102 x 136 feet. John G. Rundstrom, Avenue Sixty-six, has the general contract.

W. T. Ebur Co., Williamsport, Pa., has been incorporated with $25,000 capital to operate a gray iron foundry.

A. Weiskittle & Sons Co., Baltimore, will rebuild immediately foundry, power plant and other departments recently burned.

H. B. Sherman Mfg. Co., Battle Creek, Mich., has announced early construction of a foundry and brass finishing shop in connection with its present plant.

Rich Steel Products Co., Battle Creek, Mich., will build a 1-story foundry 77 x 83 feet and 37 x 116 feet. The Austin Co., 160 North LaSalle street, Chicago, is the engineer.

Charter Gas Engine Co., Sterling, Ill., is having sketches prepared by Frank D. Chase, Inc., engineer, Chicago, for a foundry. W. A. Robinson is president.

Walker Machine & Foundry Corp., Roanoke, Va., will rebuild portion of plant recently burned and will install additional equipment. Franklin Moore is president.

The plant formerly occupied by the Laytham Foundry, Inc., at the corner of Oraton street and Grafton avenue, Newark, N. J., has been purchased by a company reported to be the Collway Foundry, Inc., of which Robert J. O'Brien is president. According to reports the plant will be used for the production of white metal.

Temple Foundry Co., Alexandria, Va., has purchased a former distillery plant which will be remodeled for use as a foundry. V. B. Beagle is president.

J. W. Cain & Co., Second National Bank building, Houston, Tex., is planning establishment of a steel foundry, with electric or open-hearth furnace.

Quality Brass Co., Port Washington, Wis., has been incorporated to manufacture brass and aluminum castings and to specialize in machine plate work.

Lavelle Foundry Co., Anderson, Ind., will resume operations at once at its Indianapolis plant. The company also has two plants at Anderson, which have been in operation.

Dallas Brass & Copper Co., 820 Orleans street, Chicago, is buying additional machinery and equipment for a new copper and brass foundry. H. C. Bauer is purchasing agent.

Baltimore Valve Corp., Patterson Park avenue and Sinclair lane, Baltimore, has been incorporated with $100,000 capital to manufacture valves and castings by Frederick W. Brune and F. A. Morgan.

Collway Foundry, Newark, N. J., has been

incorporated with 1000 shares no par value by James M. Chapin, William D. Bingham and Robert J. O'Brien. Charles Hood, Newark, is attorney.

Monarch Foundry Co., Stockton, Calif., will double its capacity, adding a 4-ton electric furnace, two sandblast rooms, new molding machine equipment and reorganization of the machine shop. E. H. Noack is president.

Walworth Mfg. Co., Boston, which recently bought the plant of the National Pipe & Foundry Co., Attala, Ala., is making plans for additions and improvements to the plant, operation to begin July 1.

The plant of the Muncie Malleable Foundry Co. Muncie, was placed in operation May 18. The plant was damaged to the extent of $500,000 seven weeks before that date. *Noted April* 15.

Superior Bronze & Aluminum Co., Warren, O., is building a plant 40 x 120 feet in which new equipment for brass and aluminum casting will be installed. Arthur J. Gilmore is general manager. *Noted May* 15.

Hart & Cooley Co., Inc., New Britain, Conn., manufacturer of warm air registers and similar castings, has let a cotract for a similar addition to William H. Allen Co., Inc.

Davenport Mfg. & Implement Co., 1032 East First street, Los Angeles, will build factory group including steel fabricating plant, foundry and woodworking shop, at Manchester and Atlantic avenues.

A $7600 foundry building will be erected by the Samuel J. Cresswell Iron Works, Croskey street, south of Ray street, Philadelphia Michael Bros., 2125 Grace street, had been awarded the general contract.

Standard Sanitary Mfg. Co., Bessemer building, Pittsburgh, will build a 2-story factory 160 x 300 feet at Pratt and Senate streets, Indianapolis. Thompson Binger Co., Inc., 223 New Jersey street, has the general contract. *Noted June* 1.

Two additions to the foundry at the state penitentiary, Pendleton, Ind., are to be made, one 28 x 175 feet and one 70 x 70 feet.

Springfield Bronze Co., Inc., 66 Charles street, Springfield, Mass., will build a 1-story bronze foundry.

Maytag Co., Newton, Iowa, manufacturer of electrically operated washing machines, is having plans prepared by Henry Raeder, 20 West Jackson boulevard, Chicago, for a 6-story addition 85 x 213 feet, for which equipment will be required.

C. J. Sykes Die Casting Co., 2356 Byron avenue, Chicago, has been incorporated with $1000 capital to manufacture tools, dies and metal castings by Carroll J. Lord, Norman L. Olson and Ruddell F. Locke. Ashcraft & Ashcraft, 134 South LaSalle street, are correspondents.

Lloyd Sales Corp., 5536 West Sixty-fifth street, Chicago, has been incorporated with 250 shares no par value to operate a foundry and machine shop by William D. Lloyd, Haldane Cleminson and Walter G. Walker. Walter G. Walker, 25 North Dearborn street, is attorney.

M. & H. Valve & Fittings Co., Anniston Ala., recently organized with $175,000 capital has bought a site and let contract to J. E. Sirrine & Co., engineers, 309 East Main street, Greenville, S. C., for a plant. Capital will be increased to $300,000. J. W. Conway, Atlanta, Ga., is president. *Noted June* 1.

Timmins Foundry Co., Lexington, Ky., has been incorporated with $25,000 capital and will remove its foundry from Winchester, Ky., to Lexington. Incorporators are William J. Timmins, John S. Yellman and John Whalen. It will operate a general foundry, machine shop and blacksmith shop.

Elizabeth Street Foundry Co., 5833 Elizabeth street, Chicago, has been incorporated with $150,000 capital to conduct a general foundry and machine shop business by Adolph W. Lemme, Charles Frankl and Roy Massena. Weseman, Hinckley & Barnard, 29 South LaSalle street, are correspondents.

New Trade Publications

STEEL FOUNDRY EQUIPMENT — Tote boxes, hand barrows, barrels, kegs and racks of steel are featured in a catalog by the Ohio Mfg. Co., Painesville, O.

HEATING SYSTEMS—Warren Webster & Co., Camden, N. J., are mailing a folder pointing the way to heating satisfaction through use of its specialties.

BALING PRESSES—Presses for compressing and compacting various materials, including metals, are shown in a circular by the Economy Baler Co., Ann Arbor, Mich. The presses are built in various sizes.

CRANES—A bulletin by the Morgan Engineering Co., Alliance, O., features one of its types of cranes, giving details of construction of the bridge and trolley, with special features for efficient service.

MEASUREMENT BY WEIGHT—Accuracy, eliminating human and mechanical error as far as possible, is featured by the Toledo Scale Co., Toledo, O., in a circular describing its scales as used in establishments where counting may be done by weight.

STEEL BUILDINGS—Truscon Steel Co., Youngstown, O., has issued a catalog of its various products, from complete buildings to foundry flasks, illustrated by halftones of installations and brief text explaining their advantages.

HOISTS—Hoisting machinery for various classes of service is presented in detail with illustrations and diagrams in a bulletin by the Western Machinery Co., Los Angeles, Calif. Specifications and engineering details are given fully.

SCREWS—Screws, bolts, rivets and nuts are described in a 98-page booklet recently published by the Pheoll Mfg. Co., Chicago. In addition to the standard products listed, a great variety of special products are given.

COLLAR OILING BEARING—Hill Clutch Machine & Foundry Co., Cleveland, has issued a bulletin calling attention to its positive oil feed and distribution system which interposes a film of oil between shaft and bearing and reduces friction.

STEEL BUILDINGS—Possibilities of standardized steel buildings for industrial purposes are presented in a catalog by the Stefco Steel Co., Michigan City, Ind. Many possible structures is shown in detail as well as halftones of structures in use.

SPEED TRANSFORMERS—An industrial type of spur gear speed transformer is briefly described and illustrated in a folder by the Hill Clutch Machine & Foundry Co., Cleveland. Details of design and construction and data on size and performance are illuminative.

PENDULUM SCALES—Compensating, double-pendulum, automatic counterbalance devices applied to larger scales than formerly are described and illustrated in a bulletin by the Toledo Scale Co., Toledo, O. Their use in counting small parts, as a means of accuracy, is described.

TRAVELING GRATE STOKER—Riley Stoker Corp., Worcester, Mass., has issued a handsome booklet dealing with stokers. The stocker is described in detail and fully illustrated, with diagrams of various installations. The central station and manufacturing plant problem receives separate treatment.

INDUSTRIAL DISTRICT—Maps and descriptive matter relating to the Fairfax industrial district of Kansas City, both Missouri and Kansas, have been issued by the Union Pacific railroad. This district is being developed in sections and new industries added according to a plan laid down for the entire district.

STARTING SWITCHES—The Electric Controller & Mfg. Co., Cleveland, has issued a bulletin describing and illustrating starting switches for small alternating current motors. The type of switch described is a push button operated oil immersed across the line induction motor starter, providing no-voltage, overload and phase failure protection.

GASOLINE LOCOMOTIVES—George D. Whitcomb Co., Rochelle, Ill., manufacturer of storage battery, and combined trolley and storage battery locomotive, has issued a bulletin covering a positive gear drive gasoline locomotive. The power unit, clutch, transmission and construction of the locomotive are described.

MULTIPLE LIFT TRUCKS—A bulletin by the Stuebing Truck Co., Cincinnati, describes its new type of lift truck by which one man can lift loads up to 5000 pounds by four short lifts, raising the load full three inches. A 36-page catalog is just off the press, describing this and other trucks and lifting devices.

FLEXIBLE COUPLINGS—Transmission of power positively where alignment of shafts may be compensated by a flexible coupling is described in a bulletin by the Falk Corp., Milwaukee, Wis. The coupling was invented and patented in England and the Falk Corp. has American rights to its manufacture. Details of its construction are given.

TESTING MACHINES—A bulletin on hardness testing of metals and metal products has been issued by Herman A. Holz, testing engineer, New York. It goes into the best method, the best machine to apply to that method and the best accessories. In an appendix is presented a universal brinell hardness table for any ball diameter and any load ratio.

SHOVELS—In an exceptionally well prepared booklet, the Wood Shovel & Tool Co., Piqua, O., describes its line of shovels. The special features of the machine are discussed, including the step and the handles. Various uses for the shovel are given and the type of shovel illustrated which is best adapted to the particular use. Specifications and prices are given.

BUDGET CONTROL—Ernst & Ernst, New York, has issued a booklet entitled "Budget Control." The definition of a budget is given and its application to industrial business is discussed. It shows how every detail in buying, production, financing and selling may be planned in advance, then checked with and regulated by actual operations to assure profits and prevent loss.

INDUSTRIAL BUILDING—Calling it "the picture book of a new profession," the H. K. Ferguson Co., Cleveland, has issued a handsomely illustrated book to show how modern industrial building is planned and executed to give the best results to the business for which the structure is built. The recently developed system of standard buildings, which may be erected in units and added to as need requires, is given a portion of the book.

When Torpedoed by a Knocker-- SINK A DEPTH CHARGE

SCENE: A street in Los Angeles where all good movie actors go, also many who think they are good. Time: Bright sunny morning; you know it's always sunny there. Characters: A sumptuous car, perhaps the one from which dainty little Mary almost was abducted, two workmen, an innocent bystander and a drunken lamp post. What does a lamp post lean against when it gets in that condition? First Caption: Came a day when in the darkening dawn a crash was heard! Action. Camera!

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SUCH might be the start of a scenario written from the "still" that has crowded out the sage remarks of P. T. Barnum on this occasion. I'd continue, but I know the Ed's blue pencil would murder any further attempts at such. I do want you to observe this illustration closely. It says much. You may recall an editorial in the June 1 issue of THE FOUNDRY telling how the City of New York had discontinued the purchase of cast-iron lamp posts because of the inherent danger to a motorist who might collide with such a post. The idea held by the city officials was that the cast-iron post would shatter with disastrous results to the collider. It was suggested that this idea might not have had its inception in the municipal mind.

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I DO not know whether any manufacturers of competing lamp standards ever *did* suggest such a thing, but the idea is implanted firmly in this customer's mind. An interested maker of cast-iron lamp posts read the editorial and sent along the photograph here reproduced. It shows a metal shaft, evidently not a cast post, which the gentleman who sent the picture was told, "fell over without any assistance." Perhaps it did. But the charge that all pressed or stamped metal work is subject to such self destruction probably would be as unfounded as the inference that cast iron burst and flings missiles about like a hand grenade when given a sudden impact by a rampant flivver.

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THE point I want to make is this. Whenever knocking is used as a sales force, the recoil is likely to be unpleasant. When one considers the way in which cast-iron products are kicked about on every occasion and when a foundryman making gray iron is confronted by the popular misinformation about the properties of that metal, nobody can blame him if he hits back. In municipal and public work the attack directed at cast-iron products has been particularly vicious. I have seen photographs of water shooting from burst water mains and flooding city streets, used to support the statement that cast-iron pipe was inferior for waterworks lines. I recall a pitiful illustration of a heavy farm tractor which, it was said, had crashed through a cast-iron culvert pipe and killed the poor father of seven, more or less little children. These are only instances of such submarine sales methods used against iron castings. Can you blame the gray iron man for retaliating?

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IF FEAR of danger is the *only* reason which prevents the City Fathers from considering cast-iron lamp standards, might I suggest that they investigate the leading product of Akron. Let them make the posts of rubber, so that they will bend gracefully under the onslaughts of wild motor cars. Then, lest the rebound of the rubber posts be too rude, equip them with snubbers, which will permit each post gently to return to its erect position after the car has passed.

Phineas, Jr.